



LWD MEMORY LOG

Gamma Ray

Company: Noble Energy

Well: Wells Ranch State AA32-783

Measured Depth	Field:	Weld County
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County: Wein County: United States

Driller's Depth **State:** **Colorado**

Status:	Surface Location:	Other Services
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Final Print

PI No: 05-123-50174-00 Directional

b ID:	110096565	SEC:	5	TWN:	5N	RGE:	63W
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Permanent Datum (P.D.):	Mean Sea Level	Elevation:	0.00 ft	Elev. KB:	N
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g Measured From:	Rig Floor	Above P.D.:	4703.00 ft	Elev. G.I.:	4673.00
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Drilled (ft)	Logged (ft)	Azi Reference North:	Grid	Dip Angle: (deg)	66.93
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Year	10p.	10p.	Total magnetic field strength. (nT)
2013-1-13	10p.	10p.	
	1964.00	1964.00	

ud: 2019-11-5	Bottom: 16936.00	Bottom: 16923.00	Mag to Reference North Correction: (deg)	7.
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Borehole Record

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
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13.500	30.00	1964.00	9.625	36.00	30.00	1954.00
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Mind Record	Deviation Record
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Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)
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Based Mud	1964.00	16936.00	8.500	14972.00	0.91	15.16	89.69	350.42
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Acquisition System	Software Version	Other
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[illegible]

District:	BMD	Unit:	D&E

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Log Run Summary

Run No	Bit Run No.	Bit Size (in)	Bit Type	Bit Gauge Length (in)	Assembly Type	Logged Interval		Bit Depth Interval		Date / Time		Circ. Hours
						Top	Bottom	From	To	Start Logging	End Logging	
						(ft)	(ft)	(ft)	(ft)			
1	1	8.500	PDC	3.00	AutoTrak Curve	1964.00	16923.00	1964.00	16936.00	2019-11-12 00:35	2019-11-14 02:50	47.88

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Andrew Hays	2019-11-11	2019-11-14						

Mud Properties Record

Date / Time	Run No.	Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2019-11-12 03:00	1	2645.00	Oil Based Mud	9.0	8	N/A	18.2	71.5/18	Active Pit	26239	0.00
2019-11-12 15:00	1	6600.00	Oil Based Mud	9.3	11	N/A	18.0	70/18.5	Active Pit	27211	0.00
2019-11-13 15:00	1	13740.00	Oil Based Mud	9.5	12	N/A	18.0	69/19	Active Pit	26239	0.00

Equipment and Service Data

Run No.	Tool	Serial Number	Measurement	Sensor Offset (ft)	Bit Offset (ft)	Max O.D. (in)	Min I.D. (in)
1	AutoTrak Curve Steering Unit	12653420	Near Bit VSS	5.93	6.73	7.000	4.330
1	AutoTrak Curve Steering Unit	12653420	Near Bit Inclination	5.93	6.73	7.000	4.330
1	AutoTrak Curve MWD	14146739	Gamma (single)	2.20	12.32	7.000	3.250
1	AutoTrak Curve MWD	14146739	Directional (mag)	12.27	22.39	7.000	3.250

Platform	Service MWD	Directional (Mag)	Depth	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000
Service and Tool Mnemonics															
Mnemonic	Name			Description											
ATC SU	AutoTrak Curve SU			Auto Trak Curve Steering Unit											
ATC MWD	AutoTrak Curve MWD			Auto Trak Curve MWD											
ATC LCPM	AutoTrak Curve LCPM			Auto Trak Curve LCPM											

- Comments
- 1

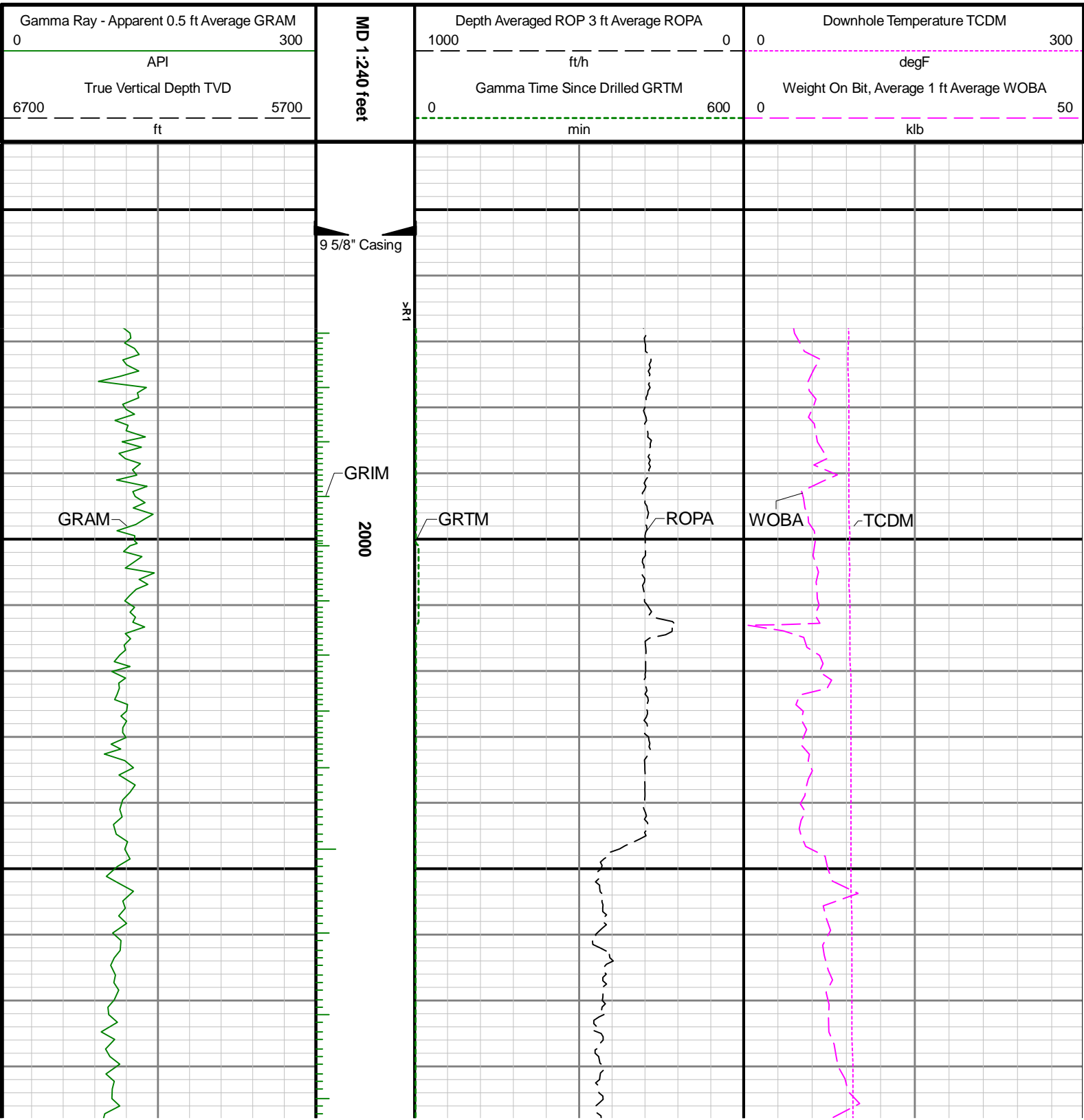
Depth measurements were obtained from a depth control system not supplied or operated by Baker Hughes. Due to the lack of control by Baker Hughes, depth calibrations and measurements could not be independently verified.
- 2

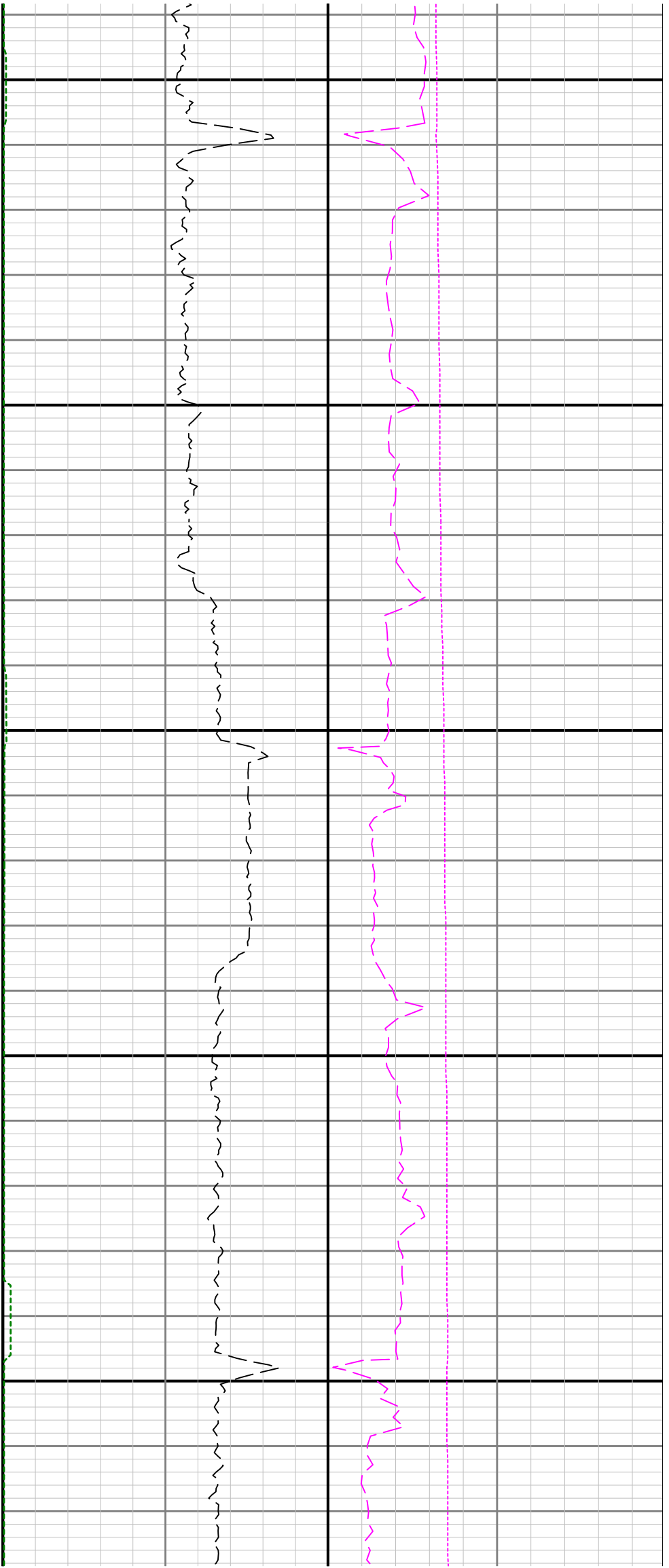
Baker Hughes LWD run 1 utilized a 6.75 inch NaviGamma service (Directional and Gamma Ray) behind a 8.5 inch bit and rotary steerable assembly from 1945 to 16936 feet MD (1945 to 6618 feet TVD).
- 3

The Gamma Ray Apparent (GRAM) data is presented 0 to 300 API, per the customer's request.
- 4

Several gaps appear in the log due to an internal communication issue with the MWD tool.

Remarks				
Number	Depth (ft)	Hole Section (in)	Run No.	Remark
1	15708.00	8.500	1	The interval from 15708 to 15801 feet MD (6615 feet TVD) has missing data due to losing connection with the third party depth tracking system.
2	16926.00	8.500	1	The interval from 16926 to 16936 feet MD (6618 feet TVD) was not logged after being drilled due to sensor to bit offset at well TD.

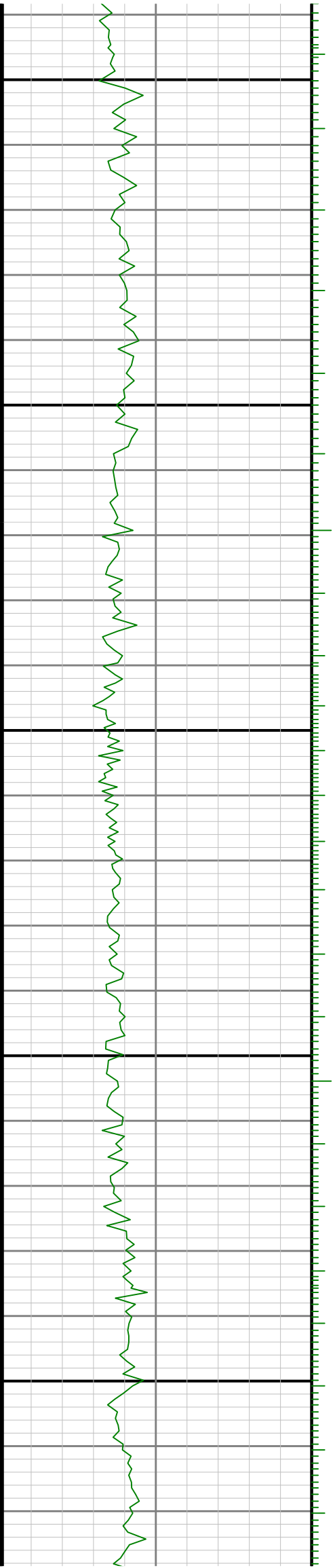


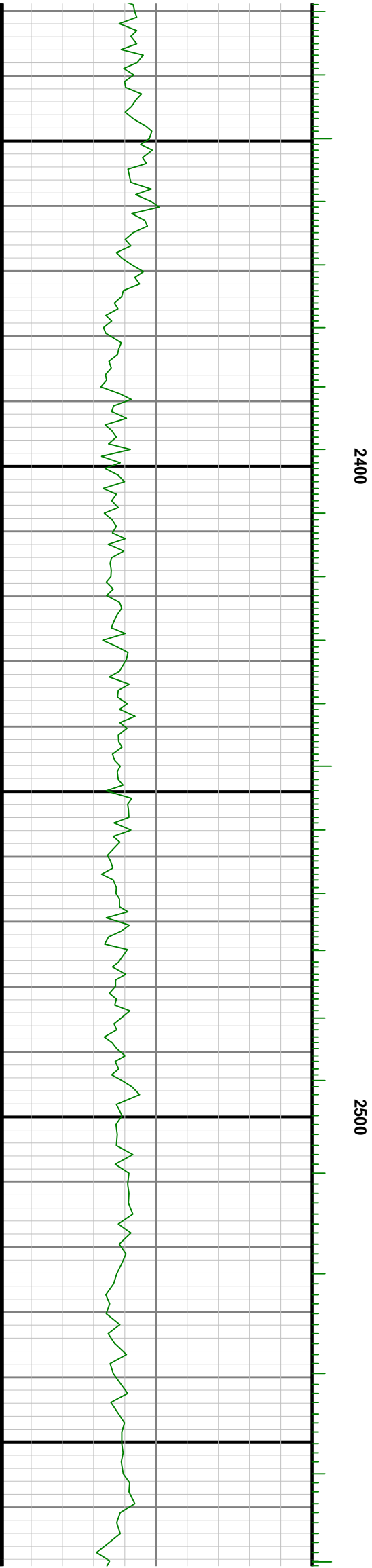
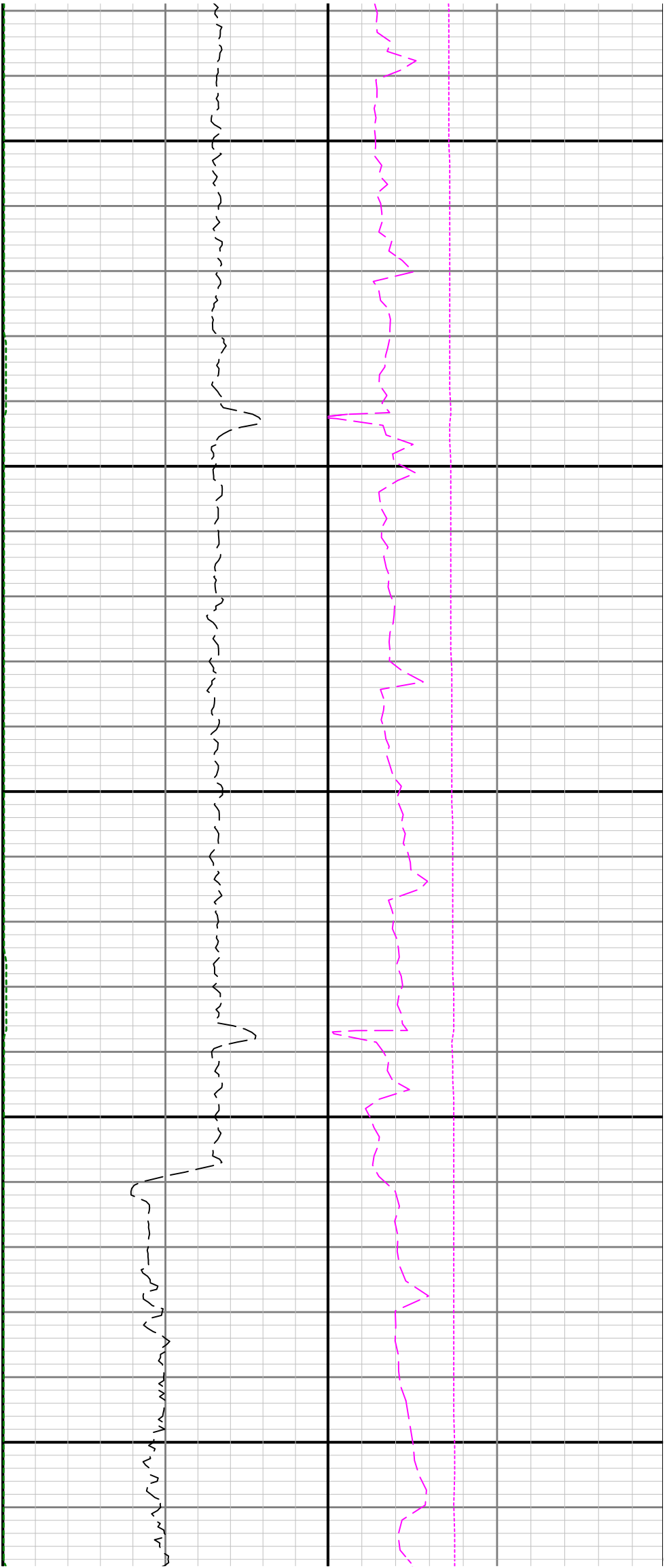


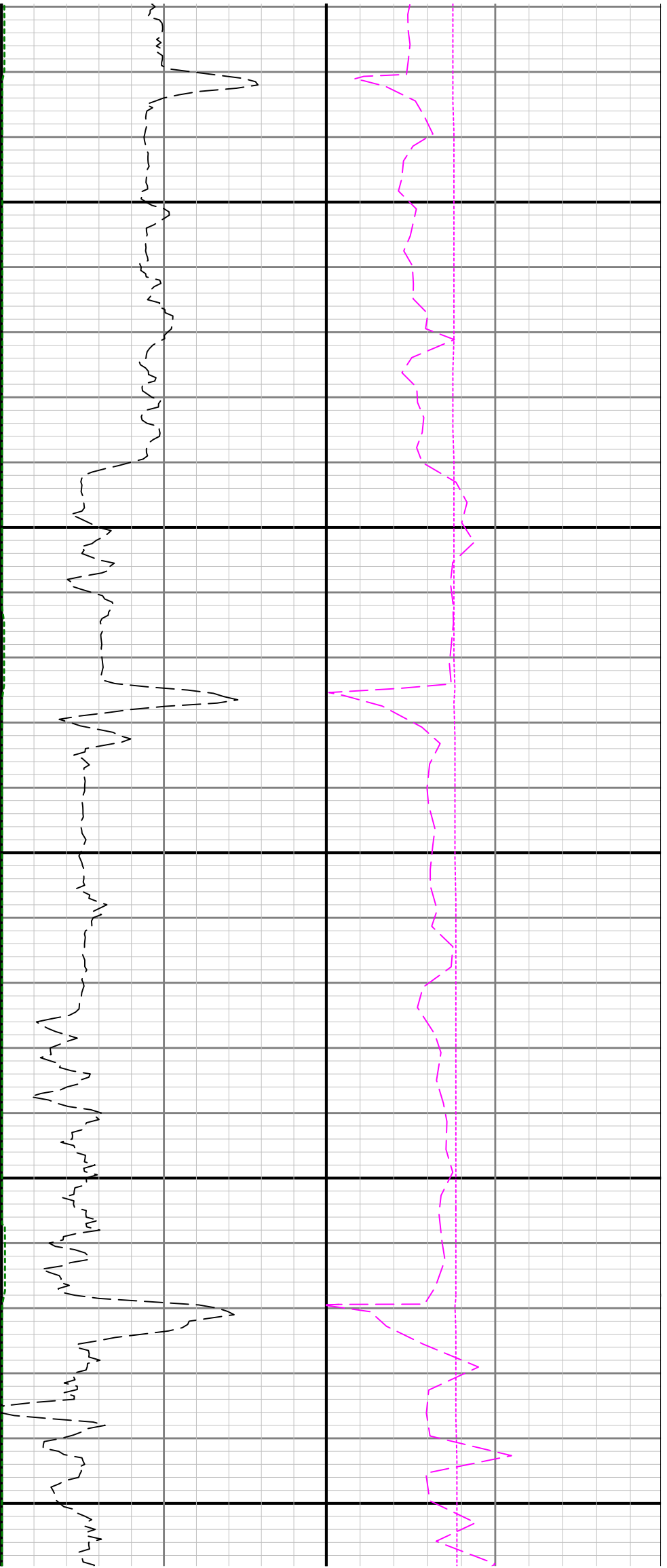
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2300



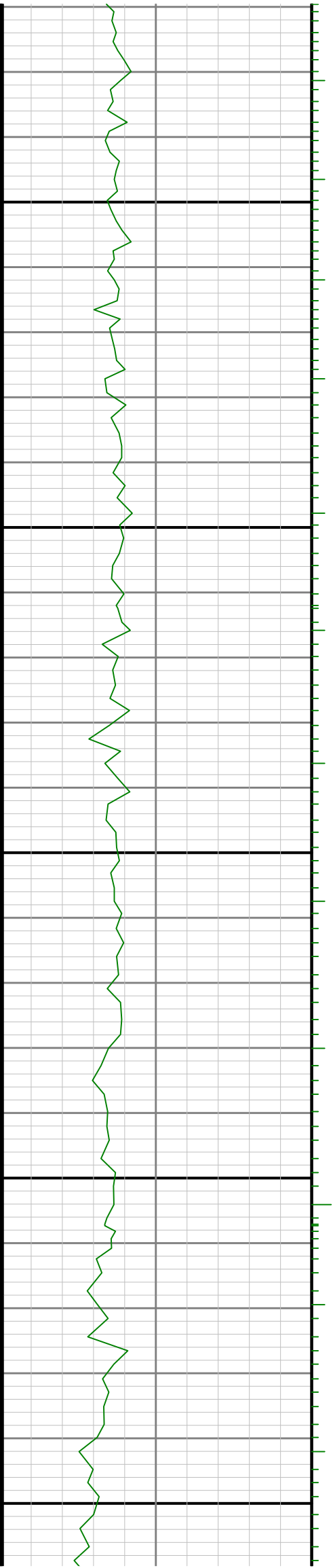


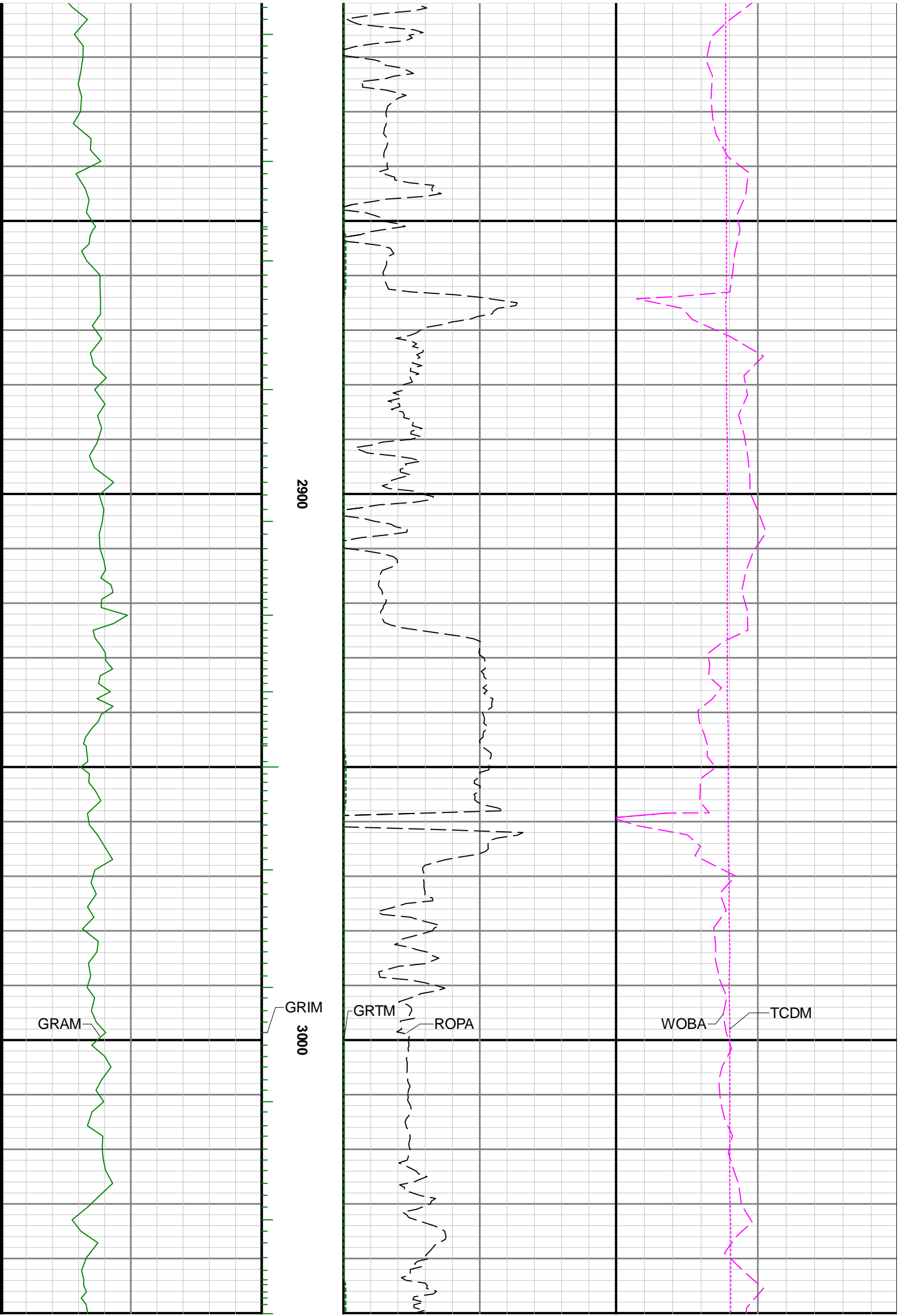


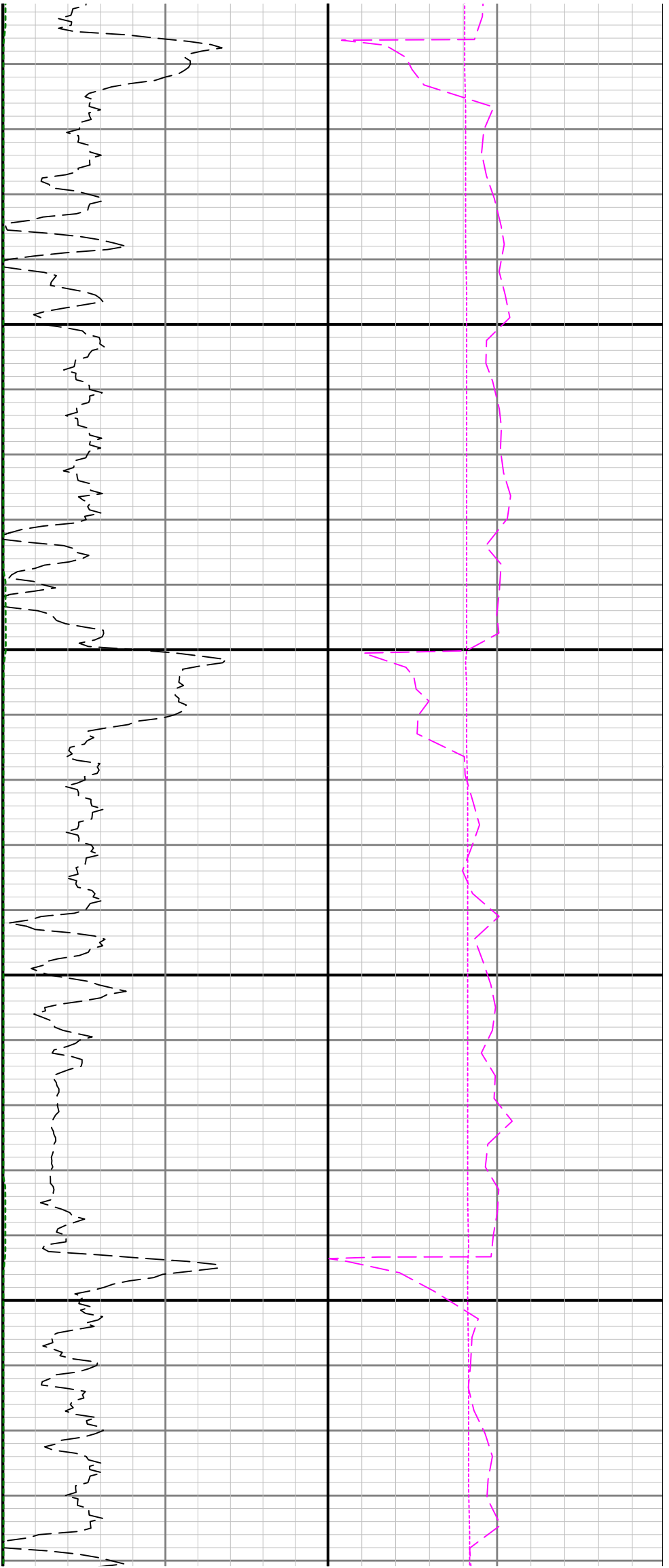
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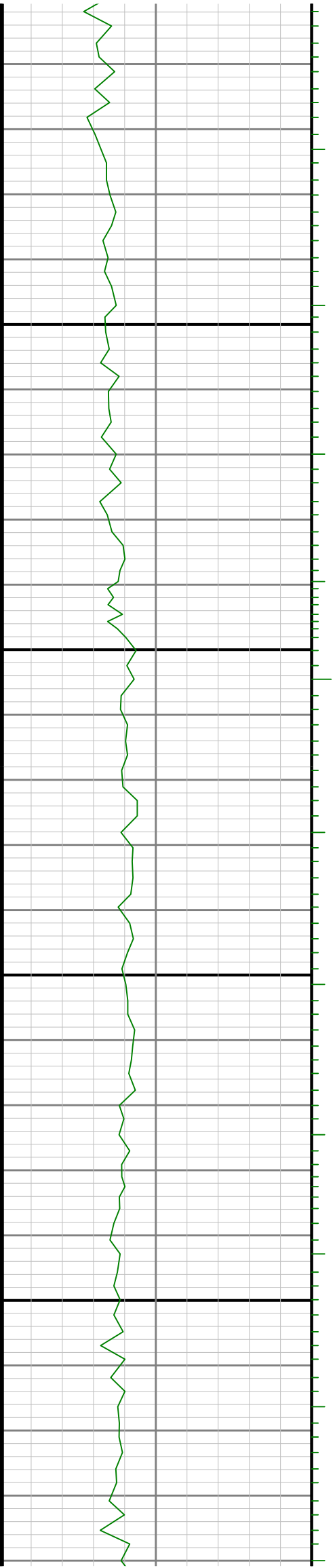


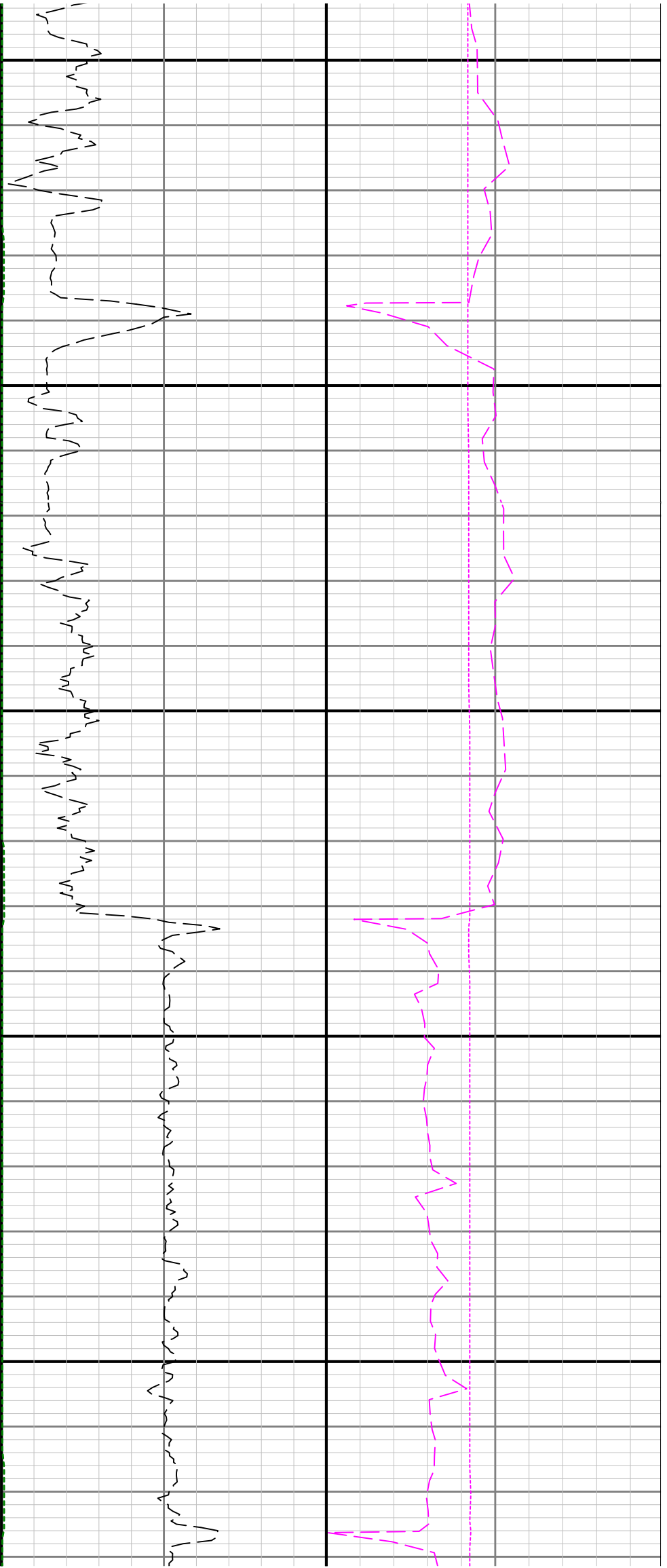




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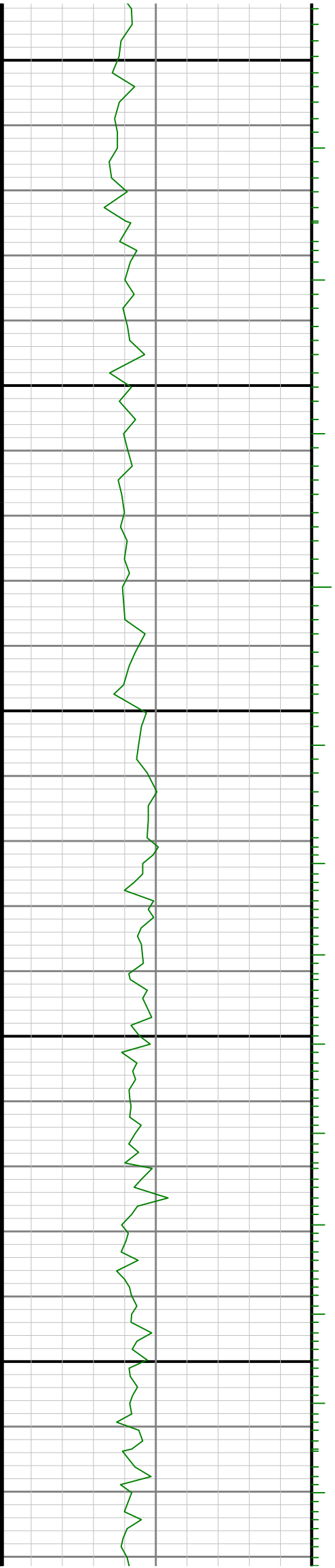
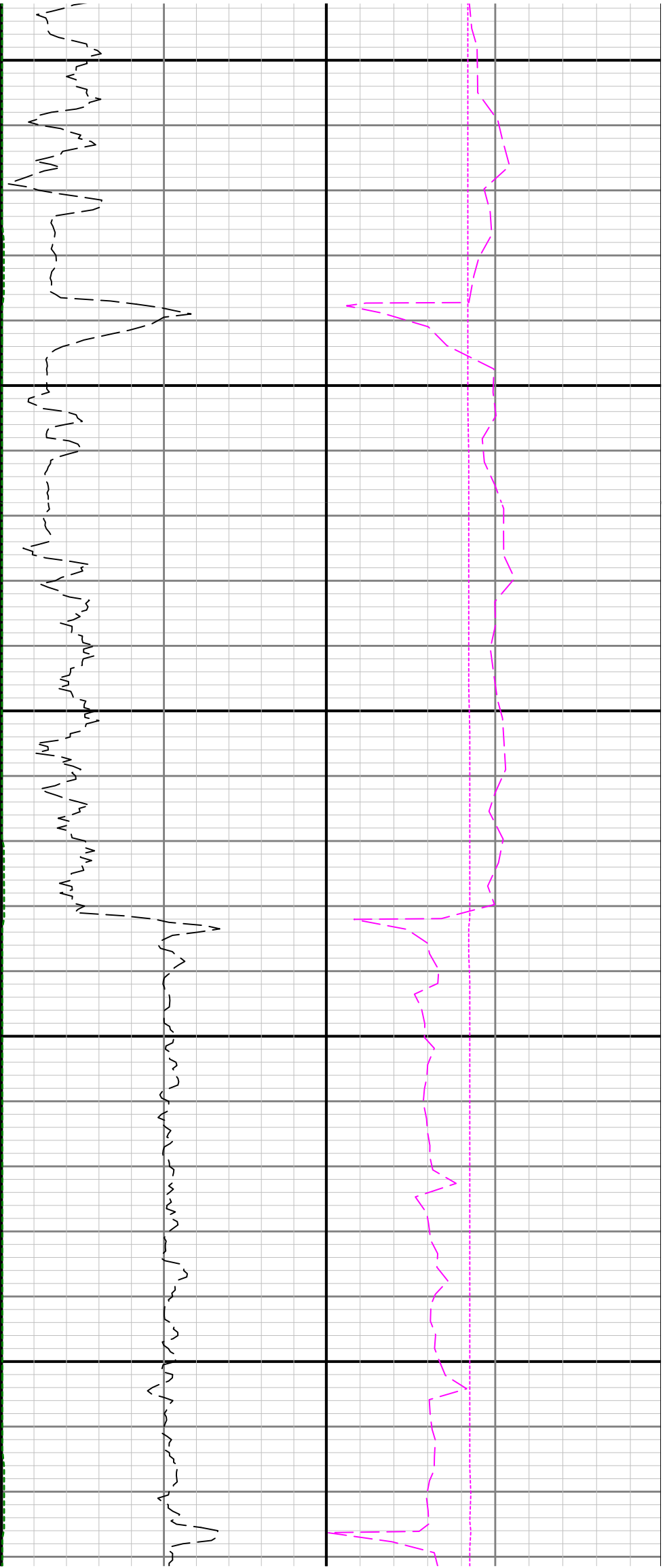


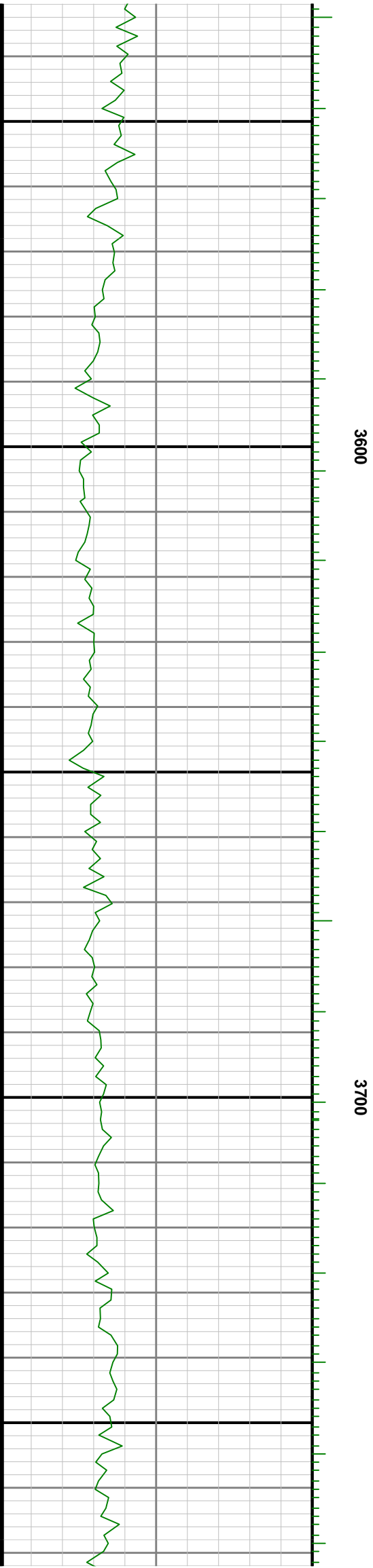


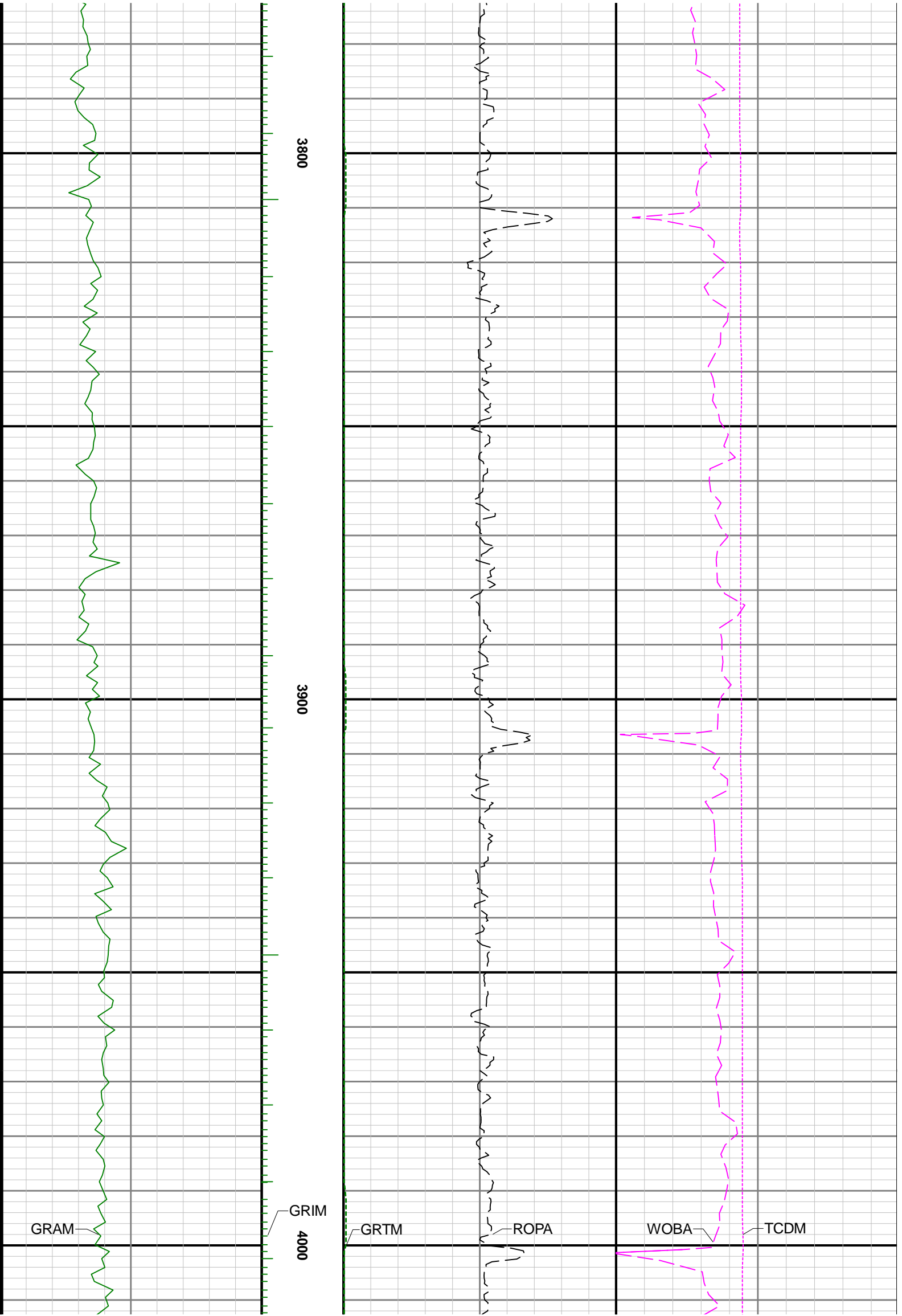
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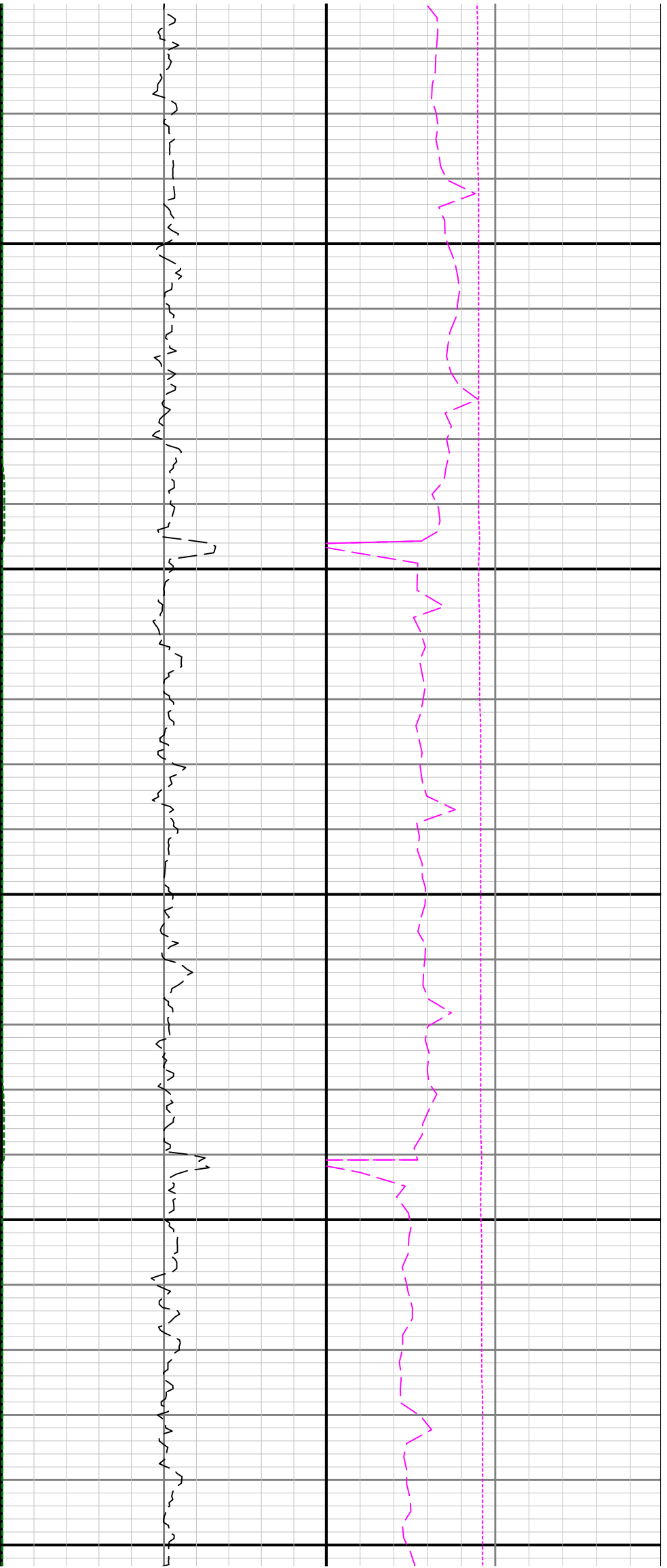
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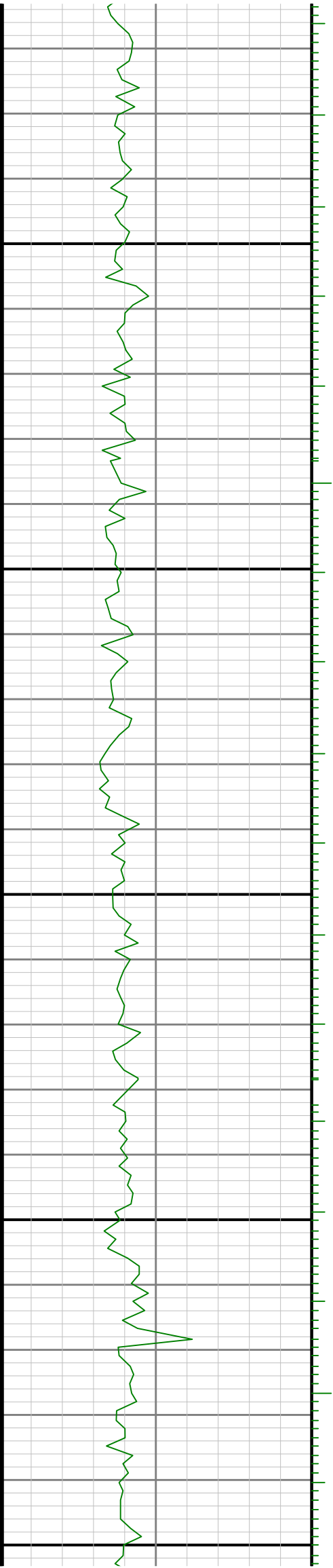


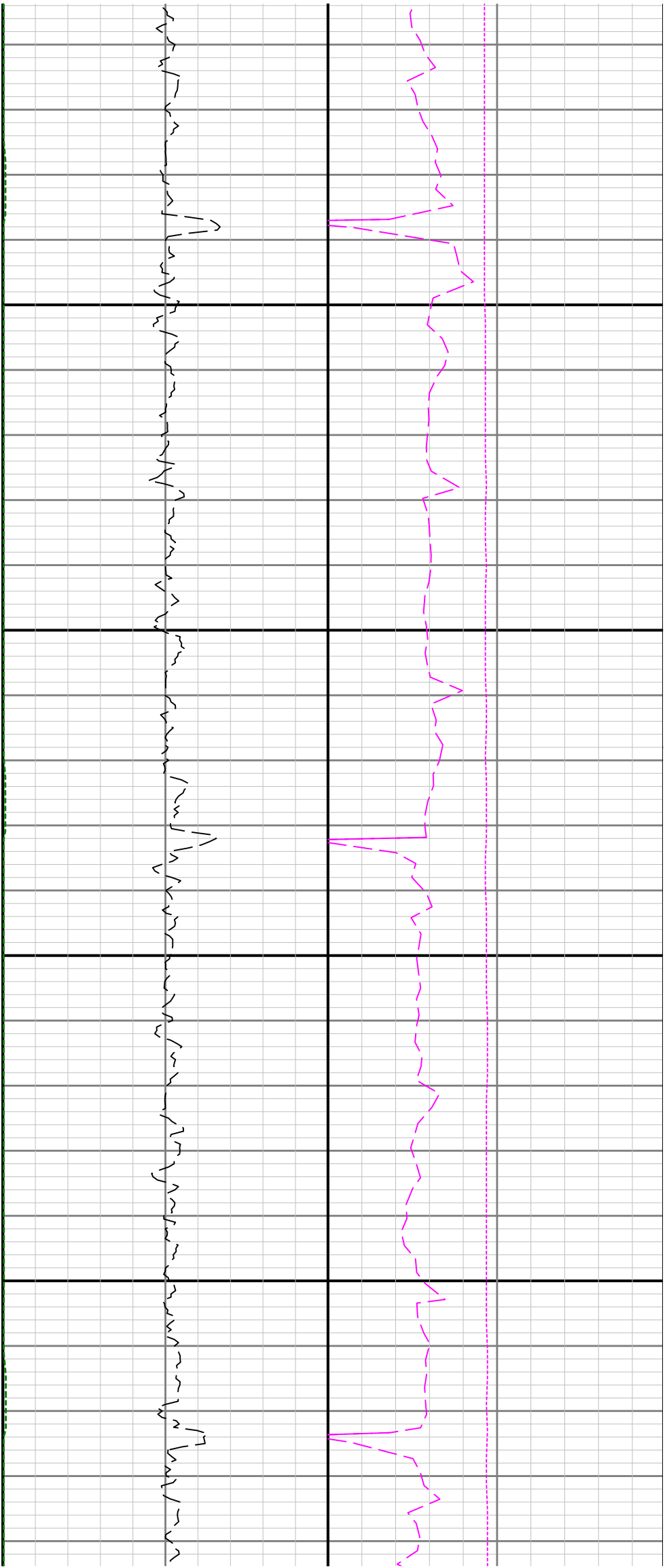




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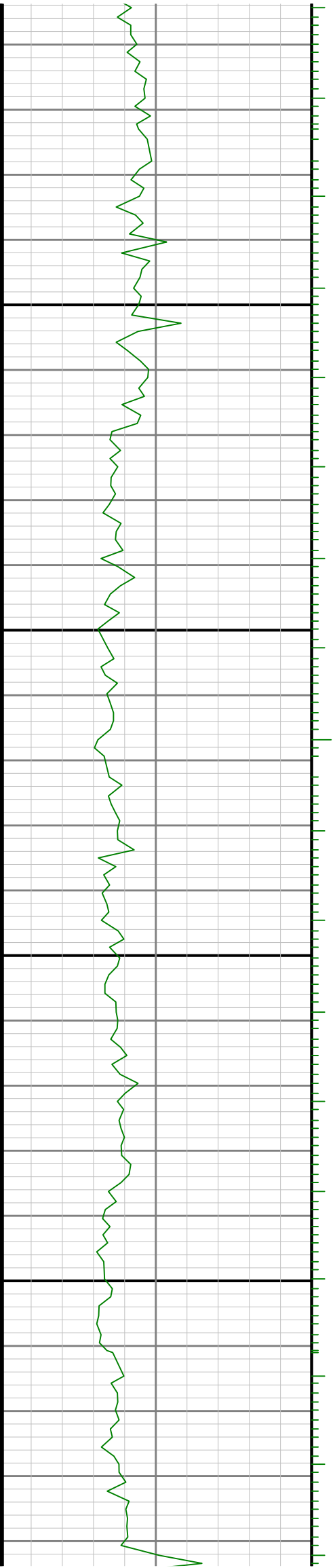
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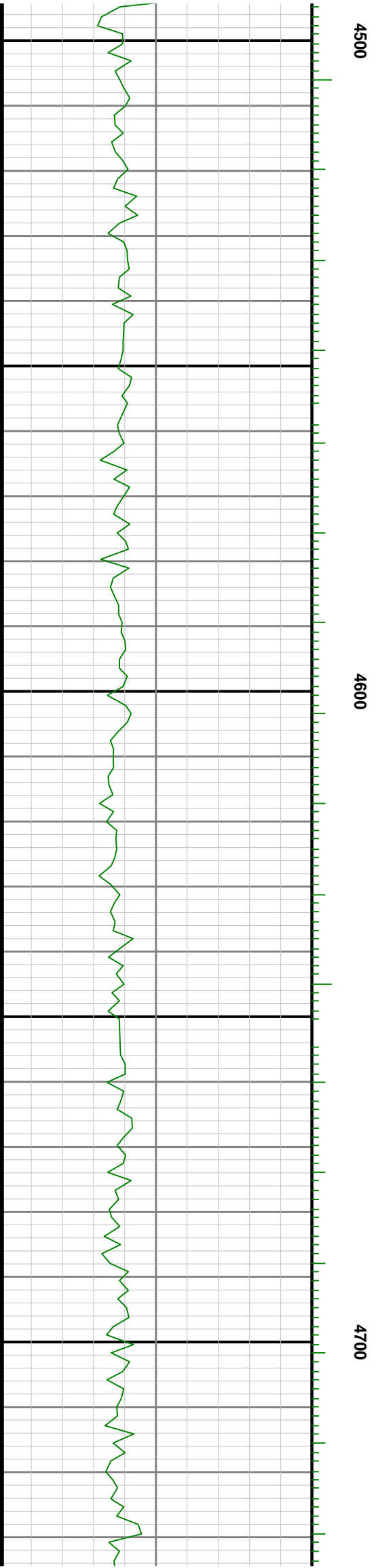


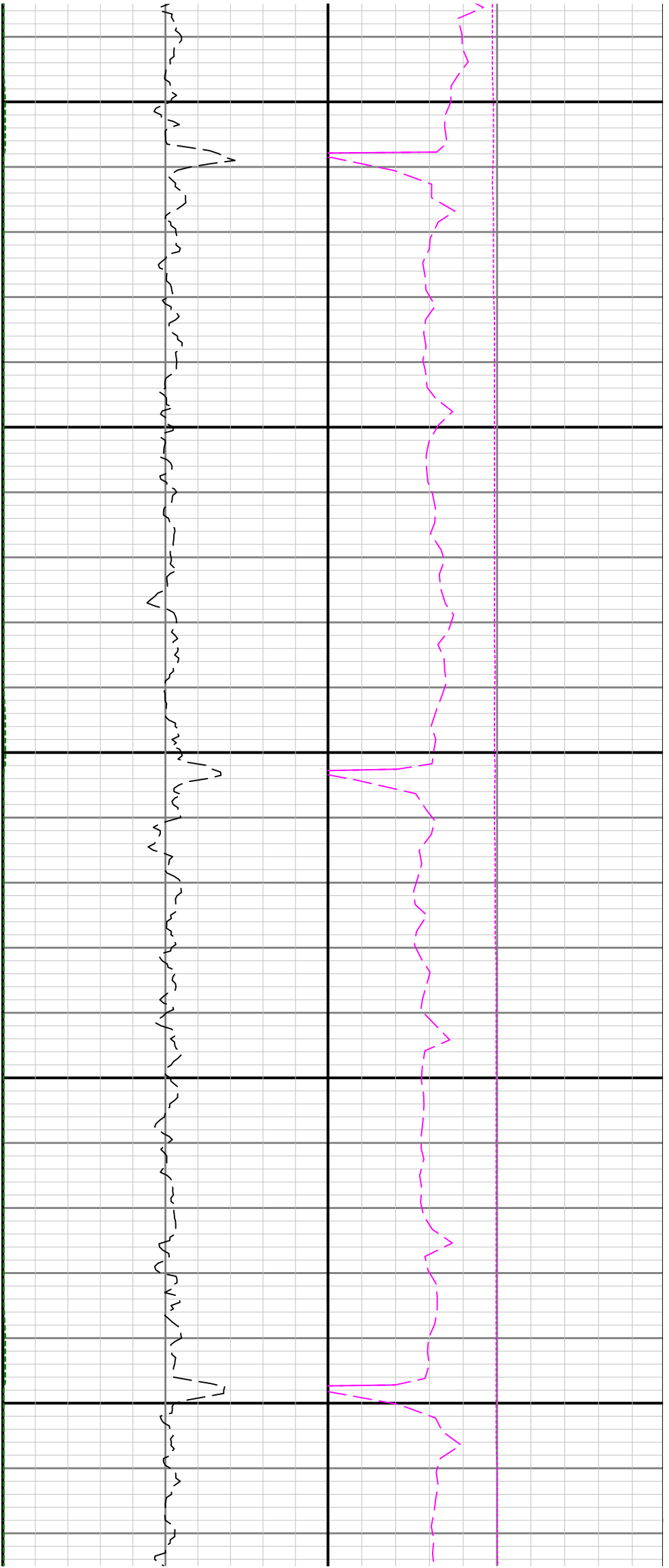


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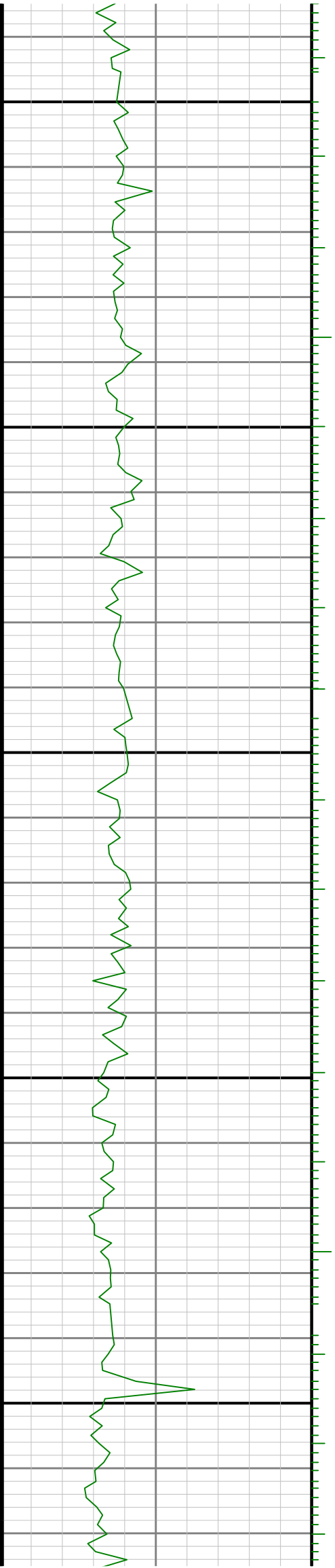




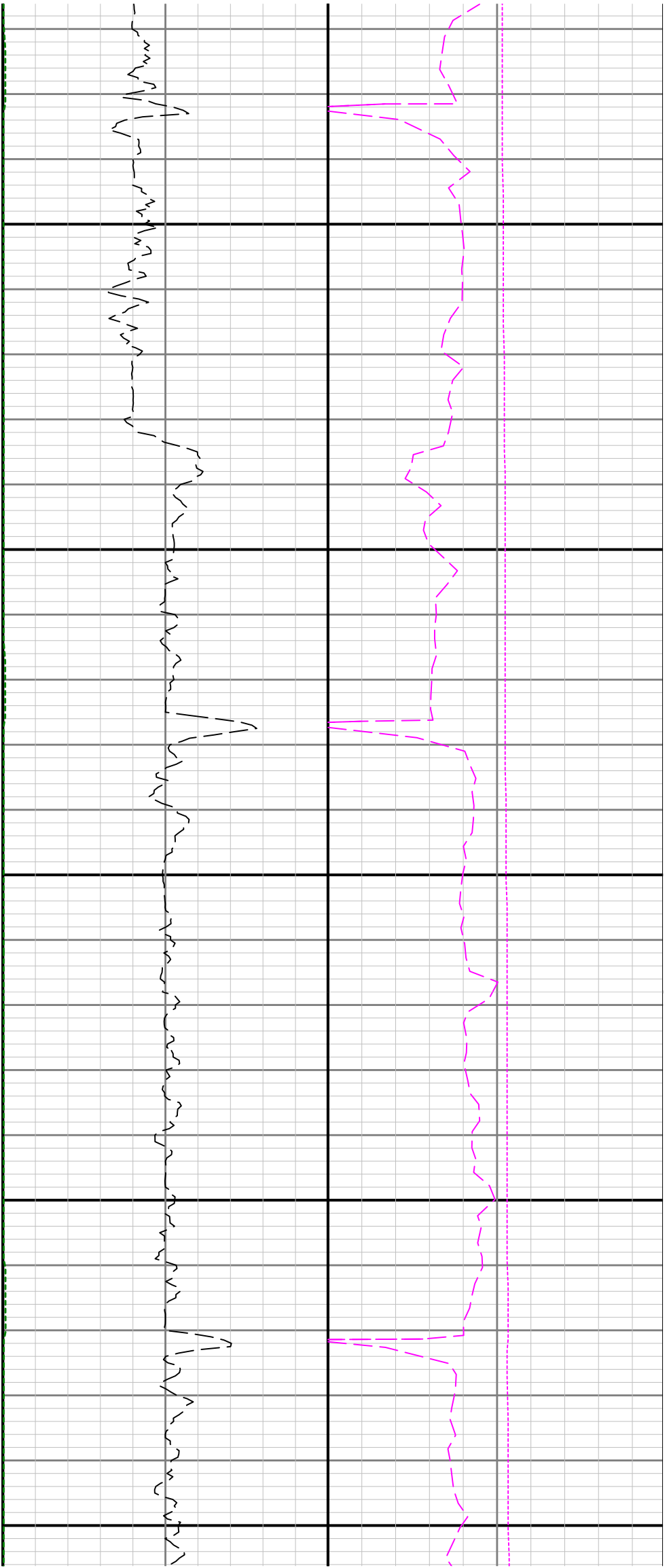


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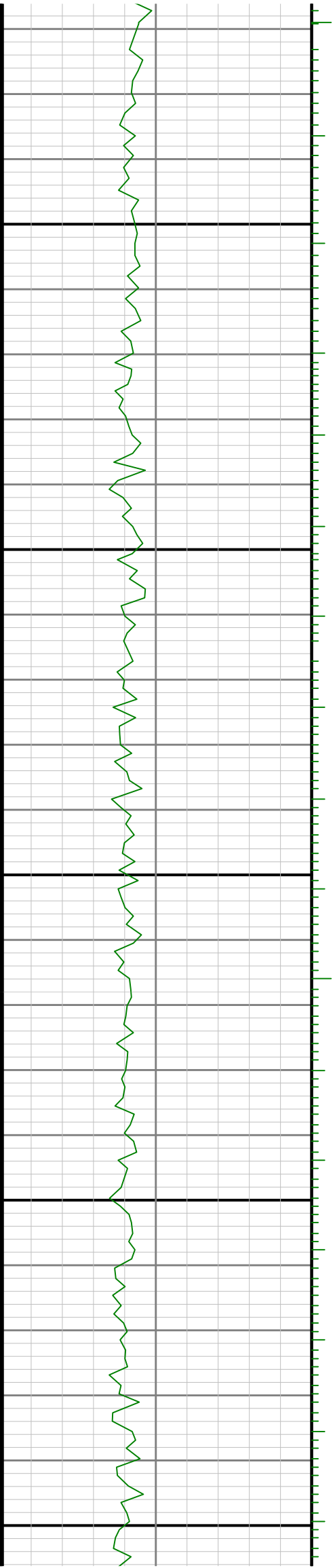


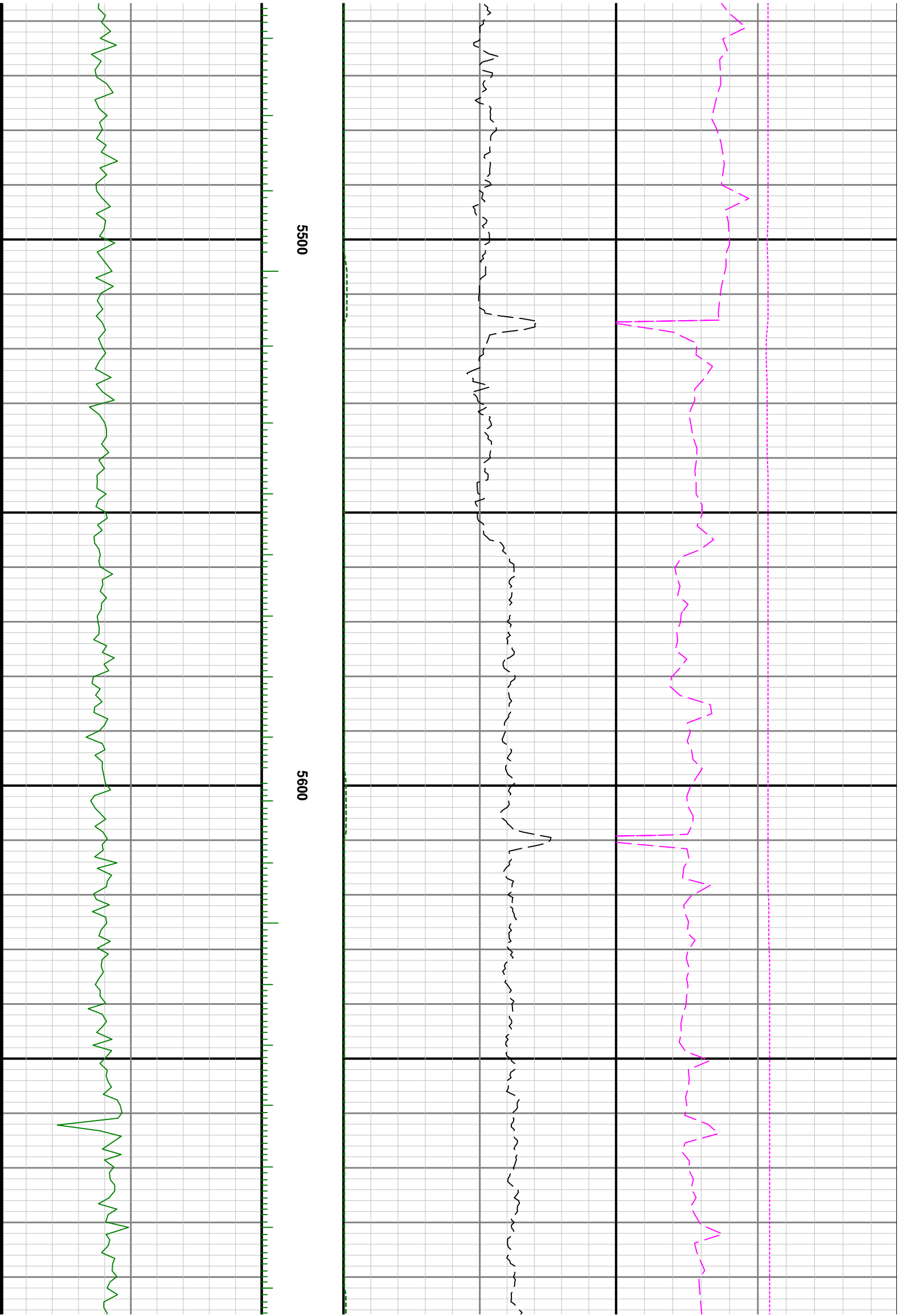


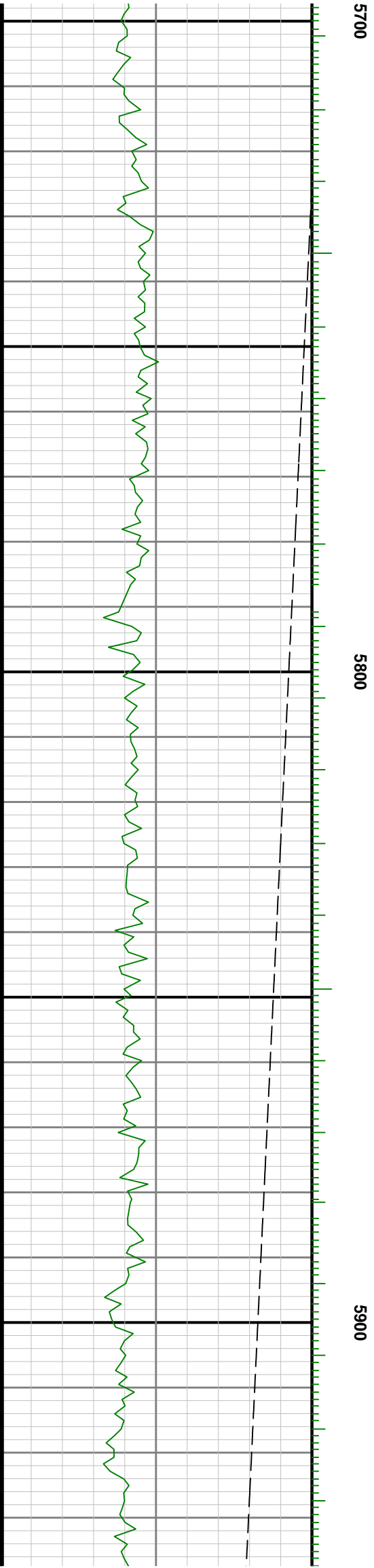


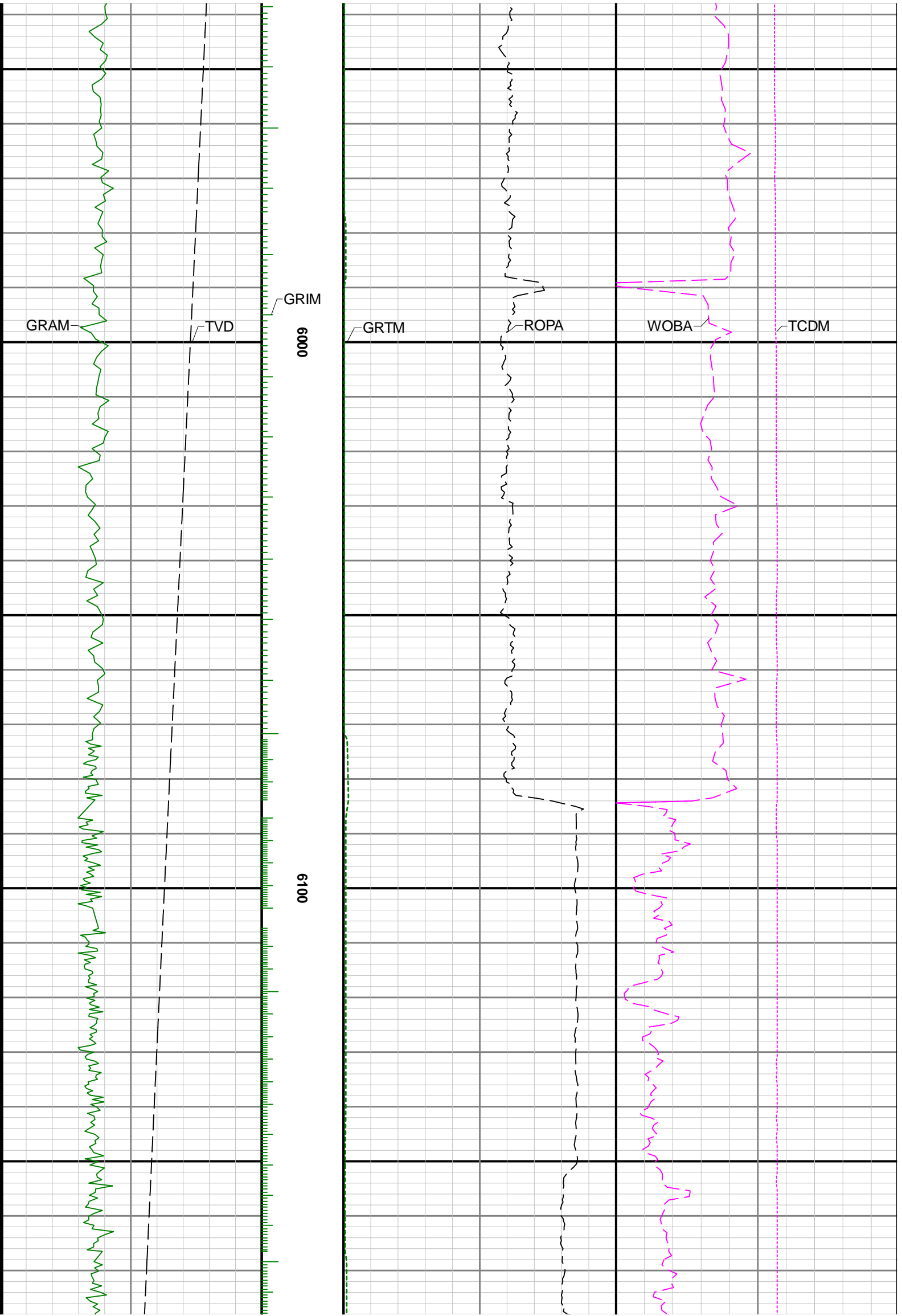
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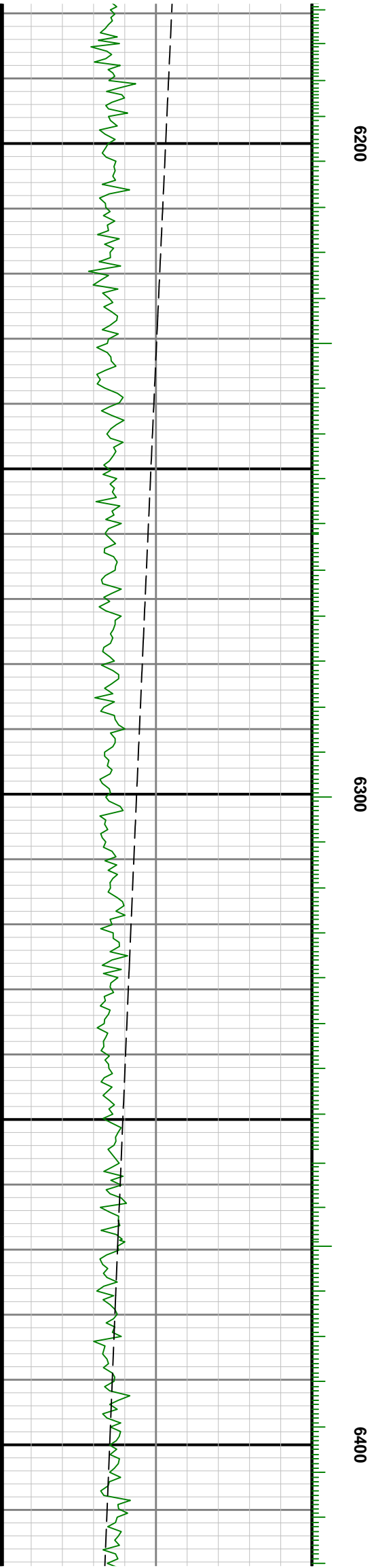
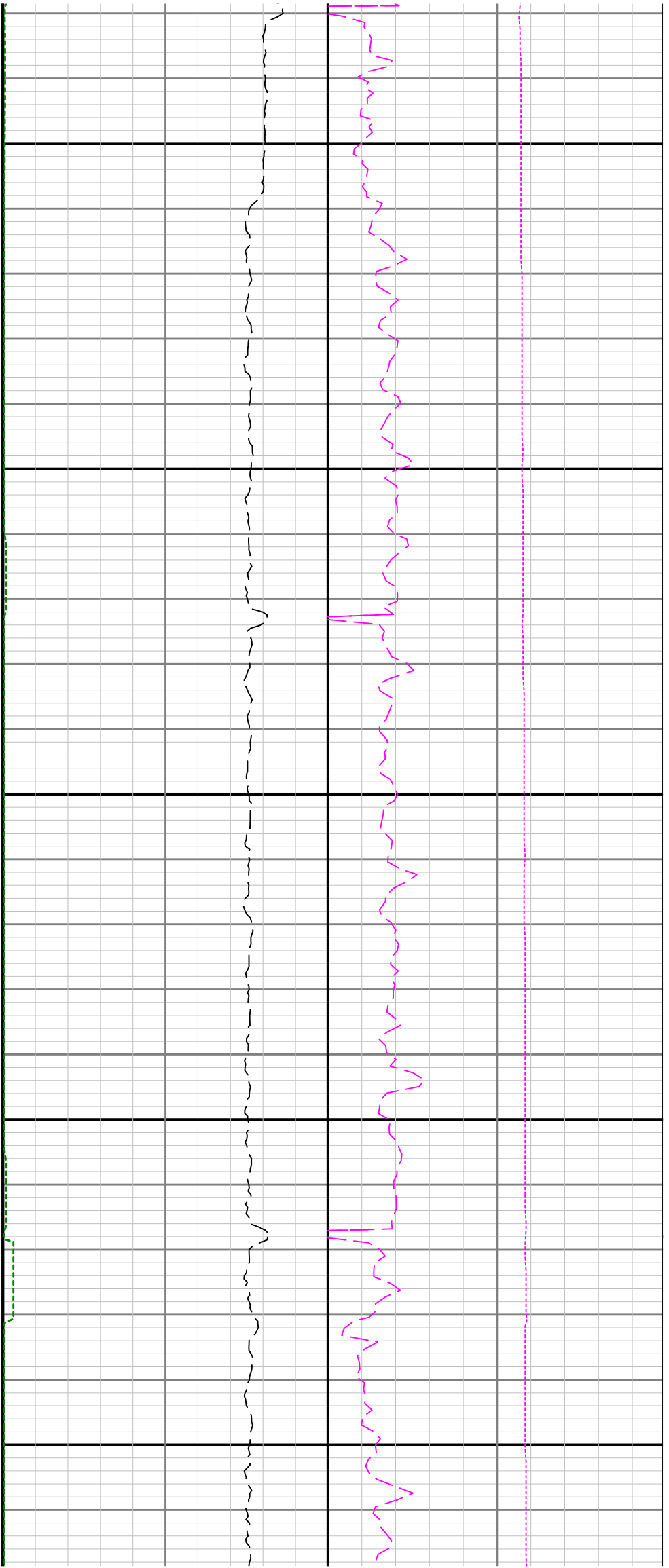
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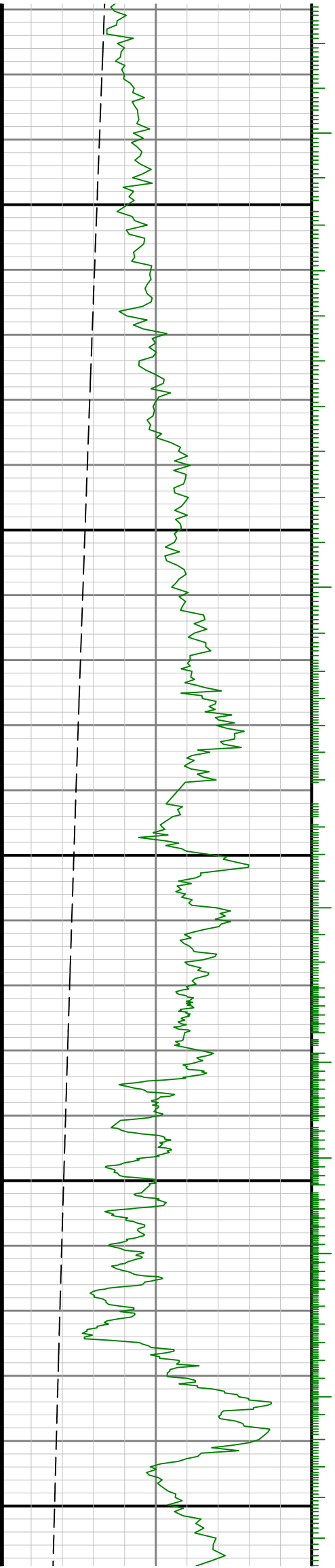






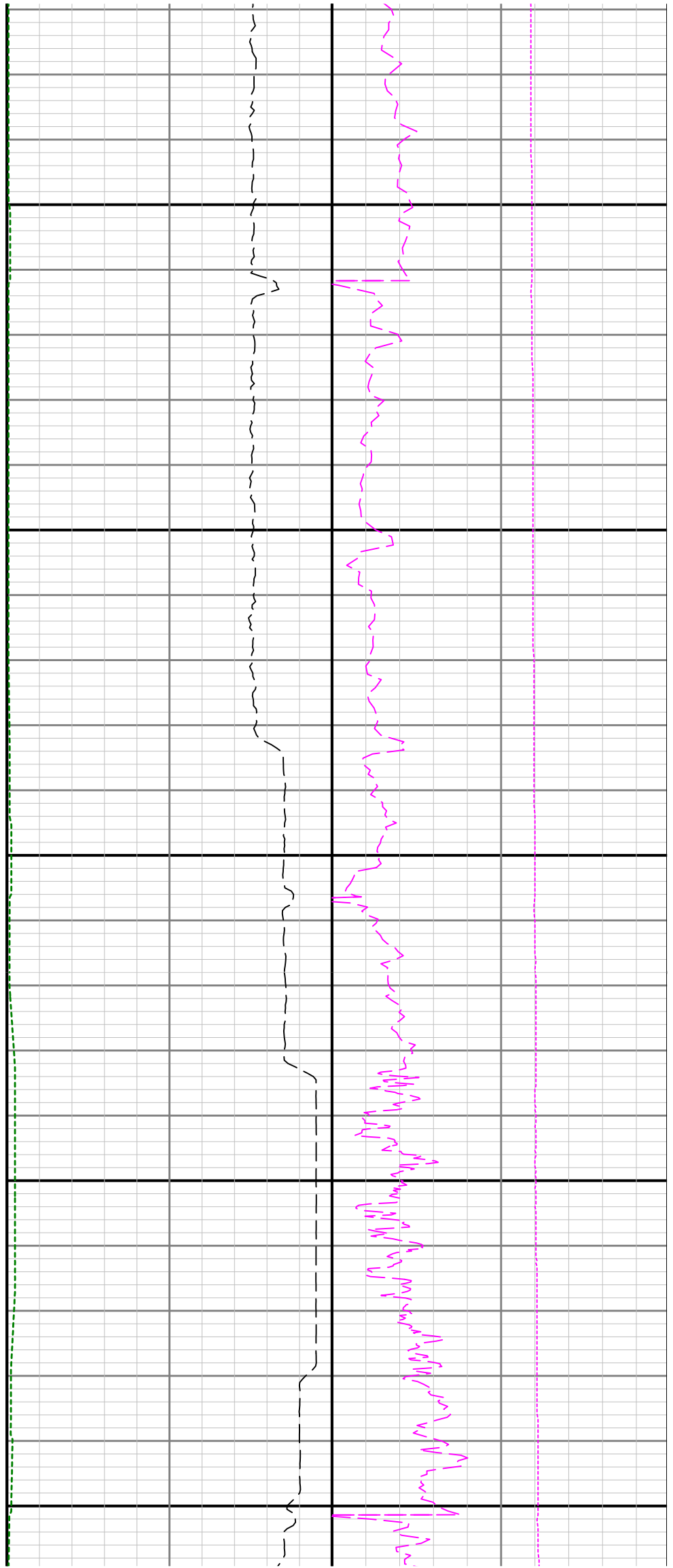


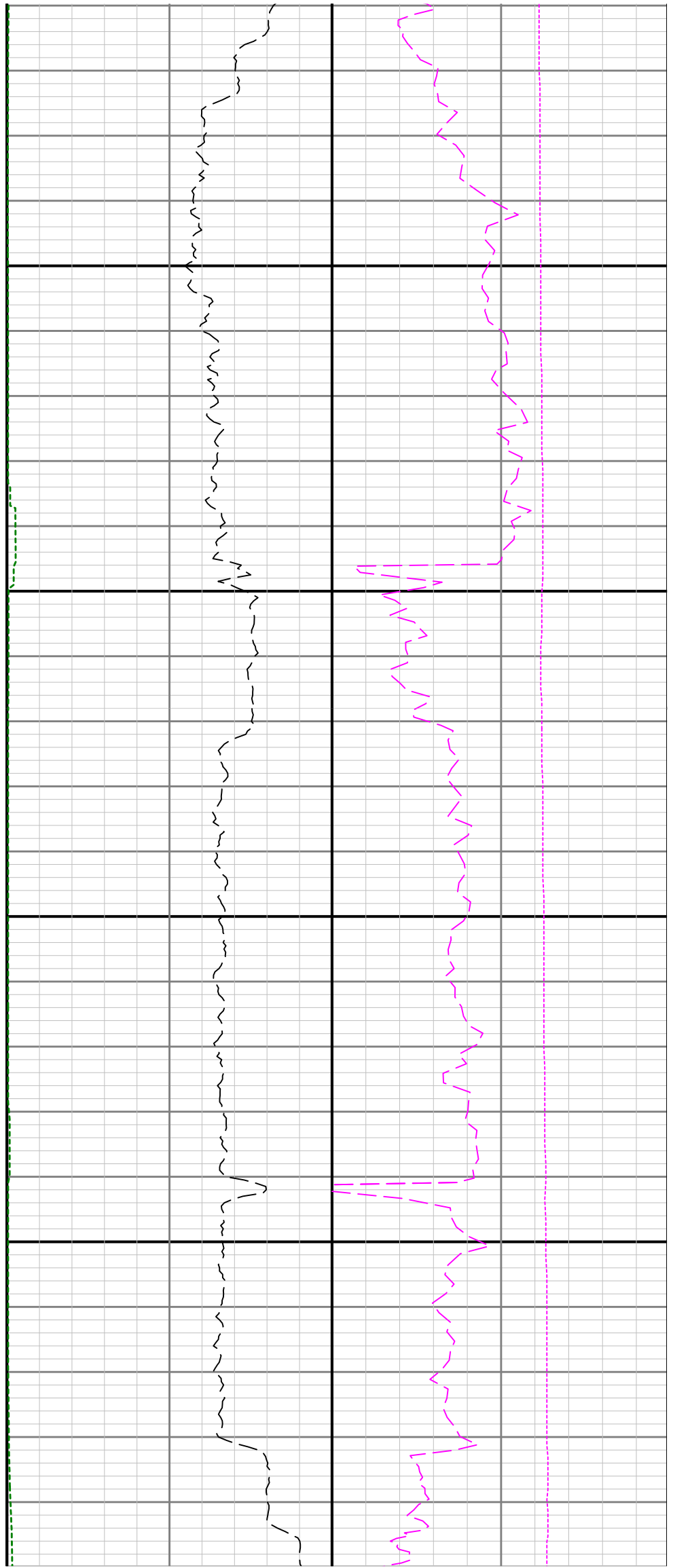
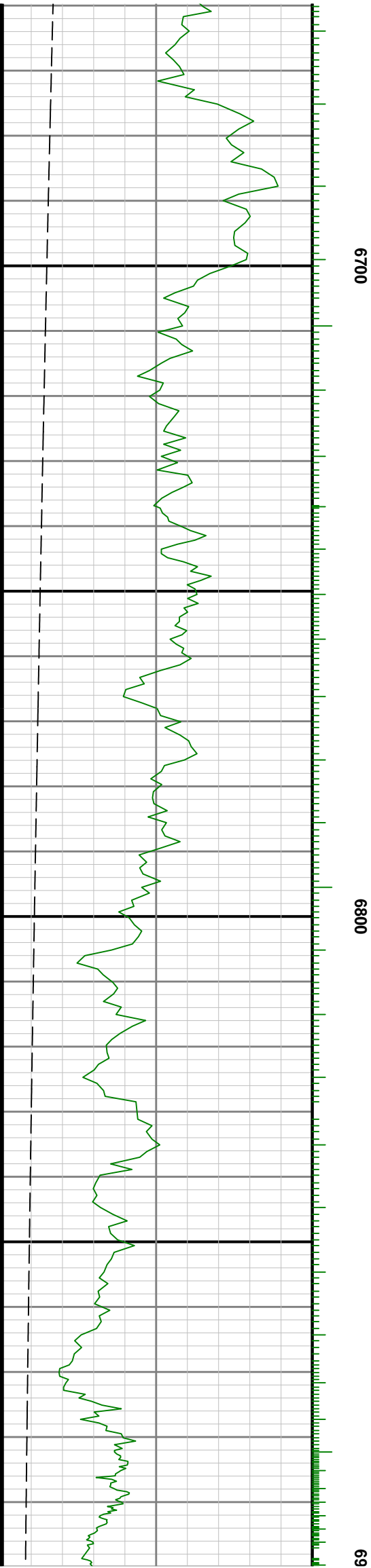


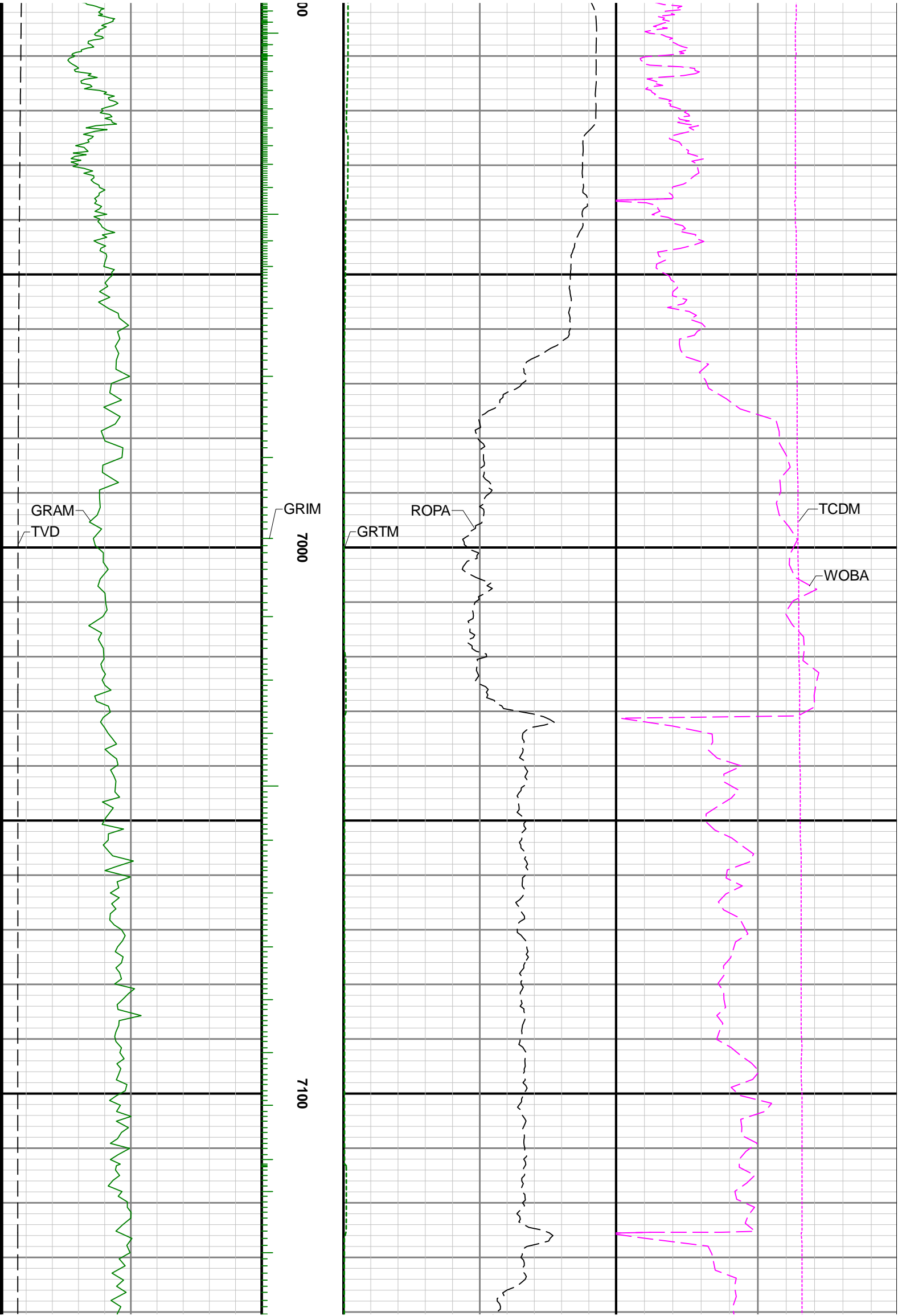


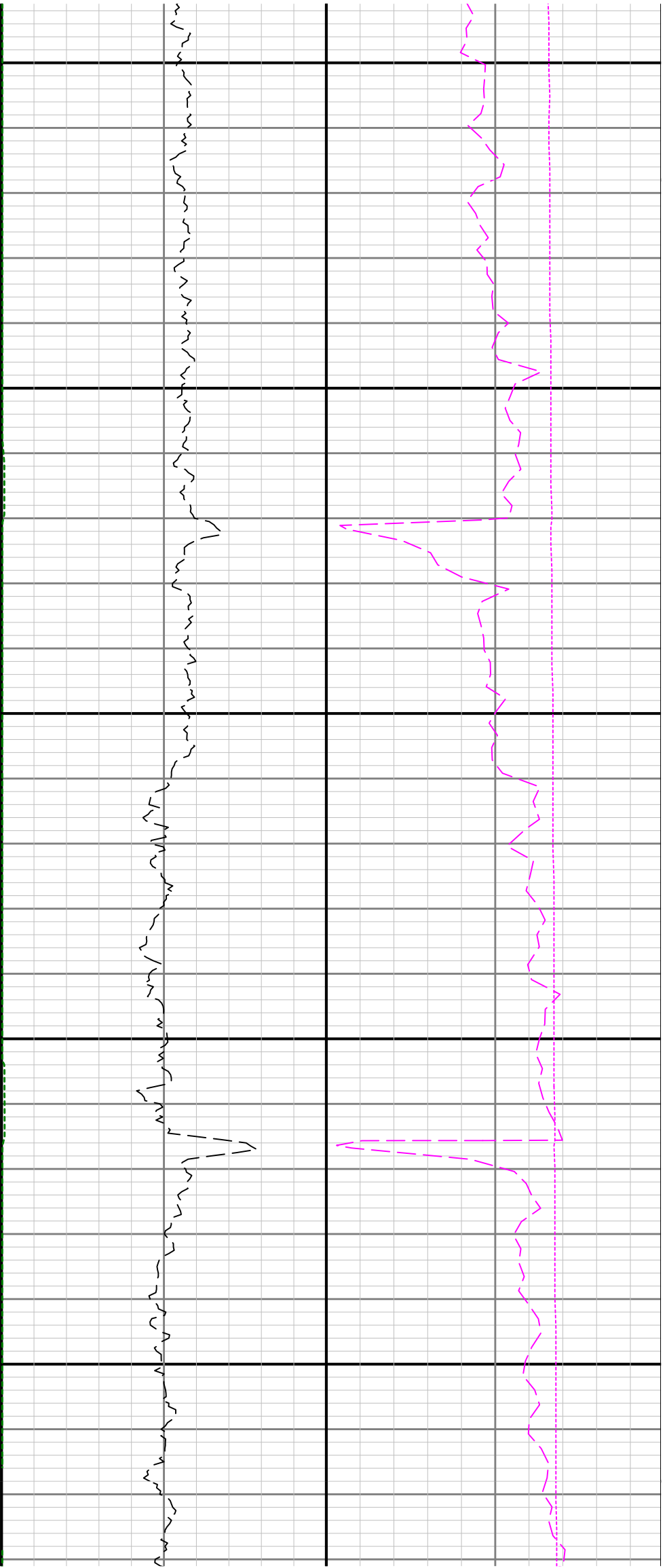
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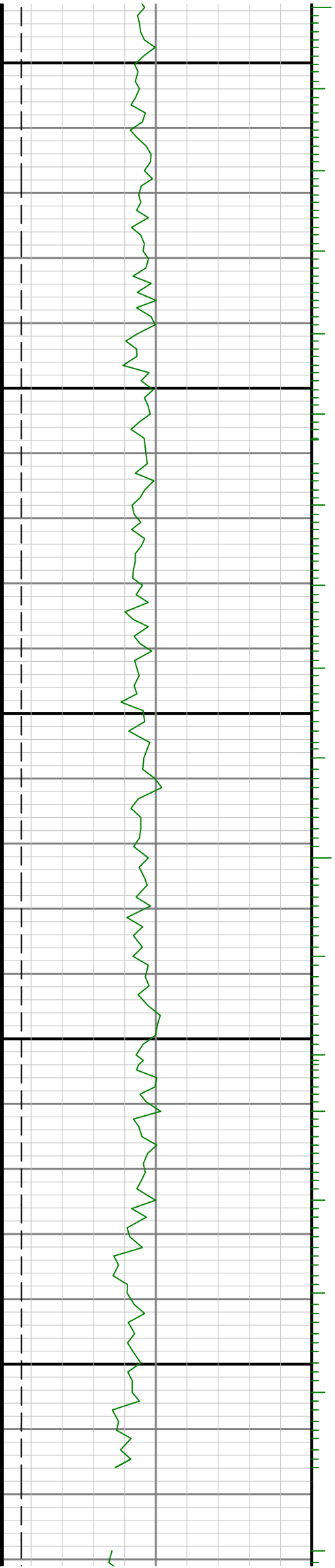


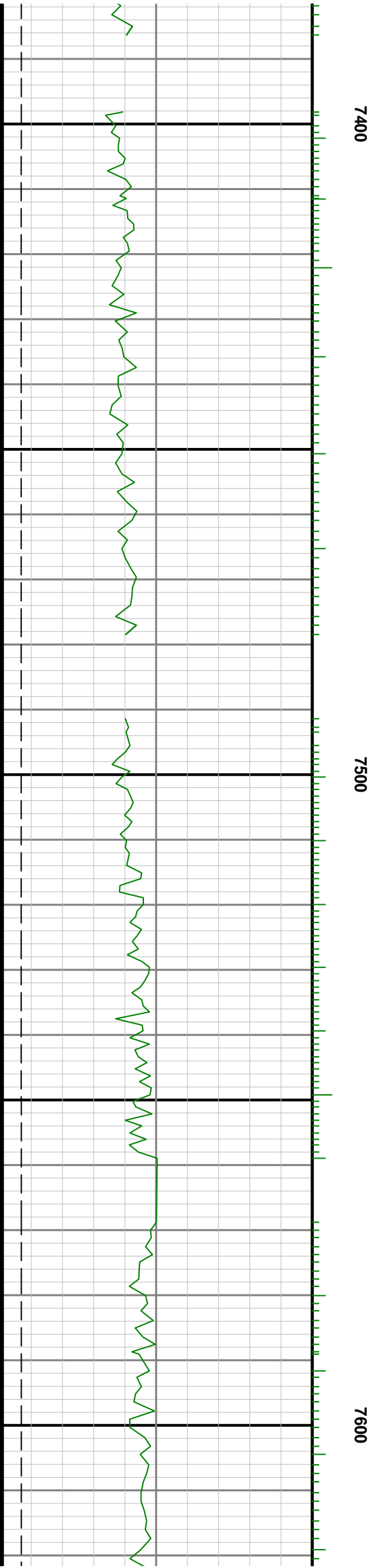
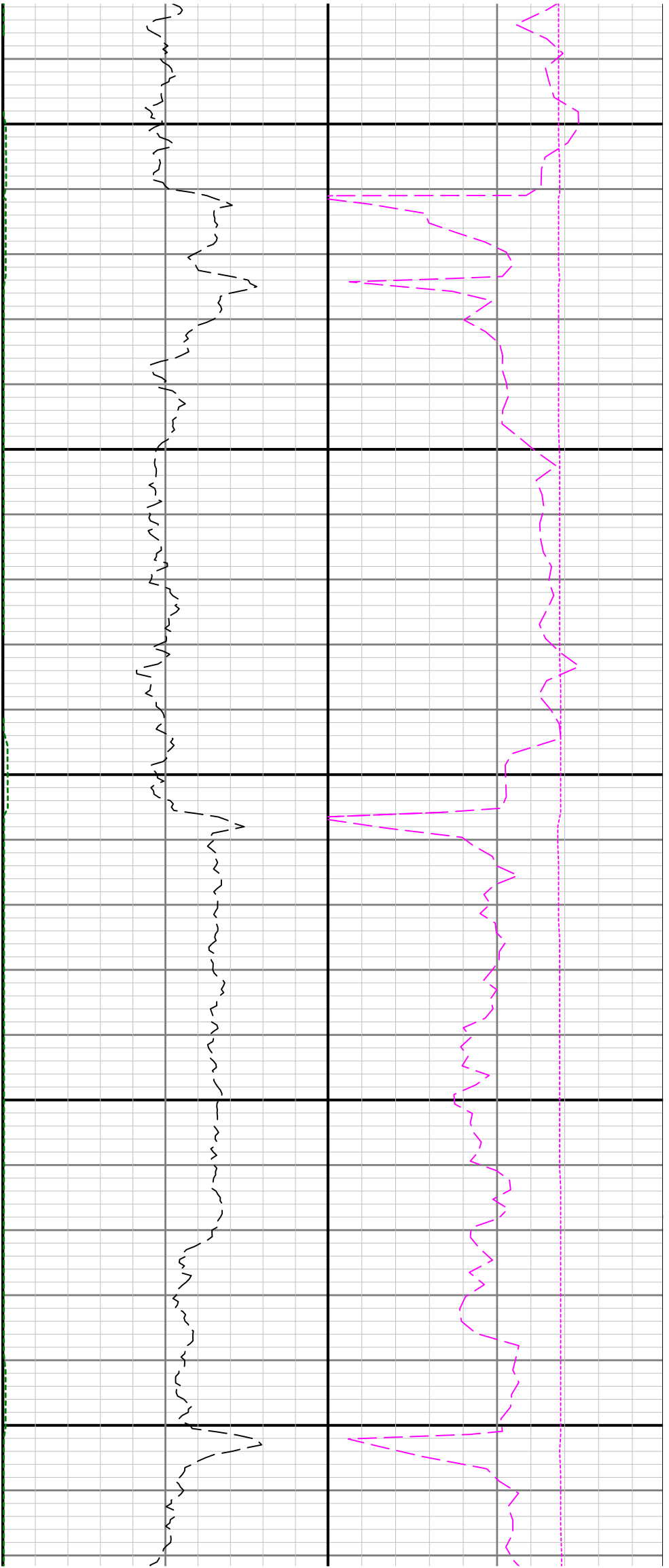


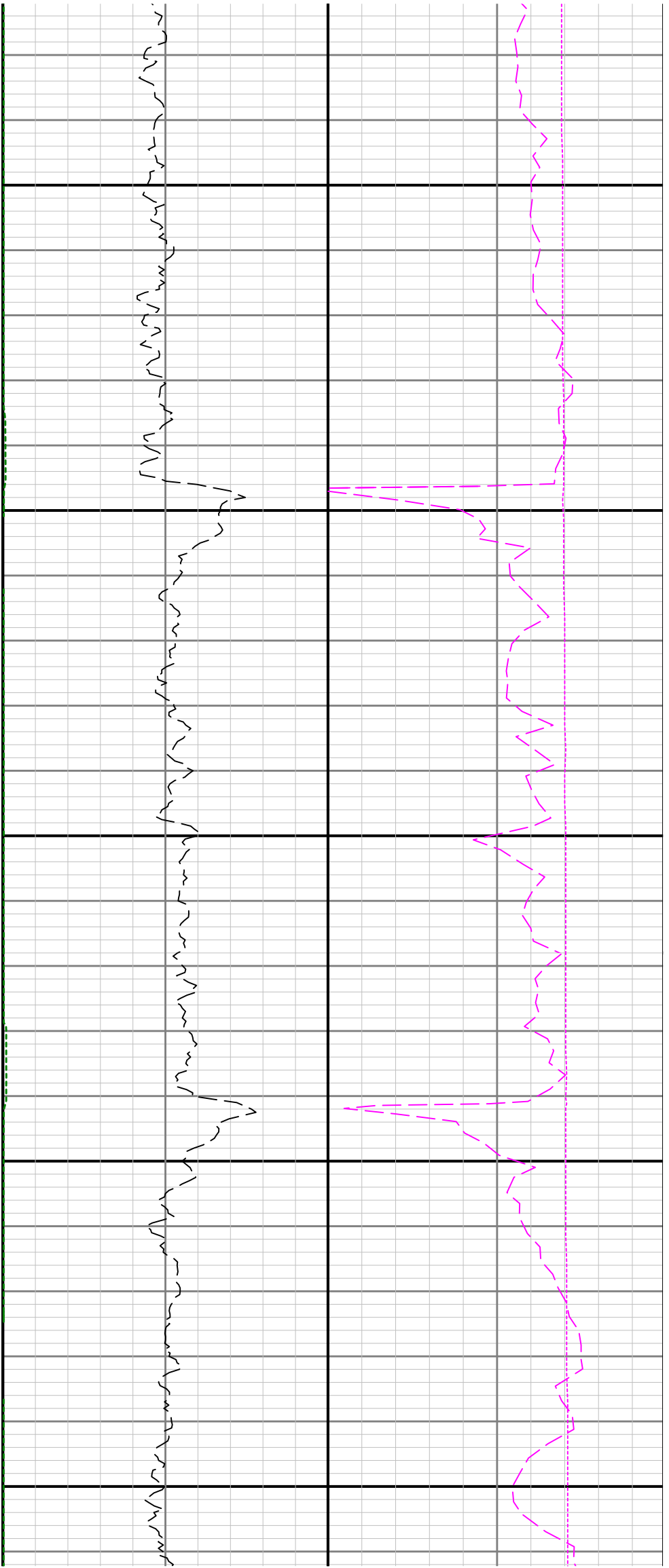


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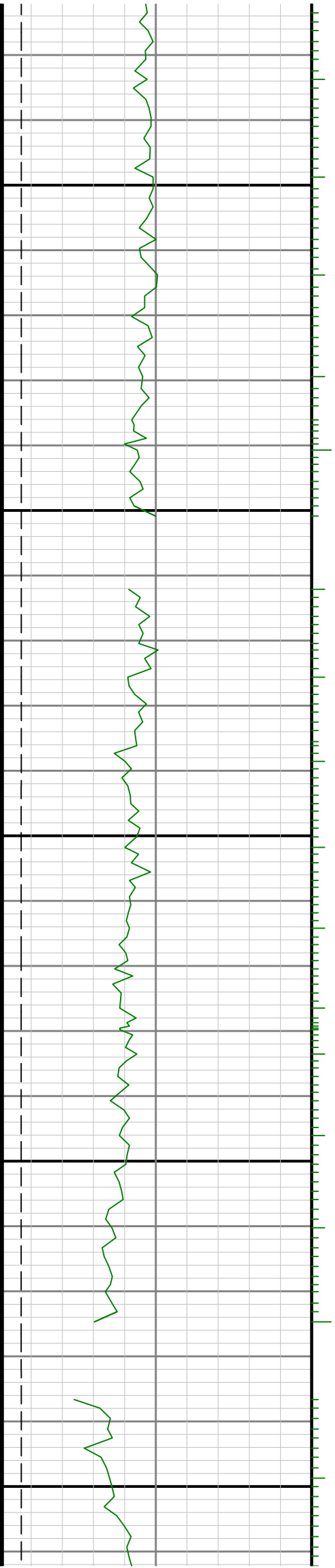


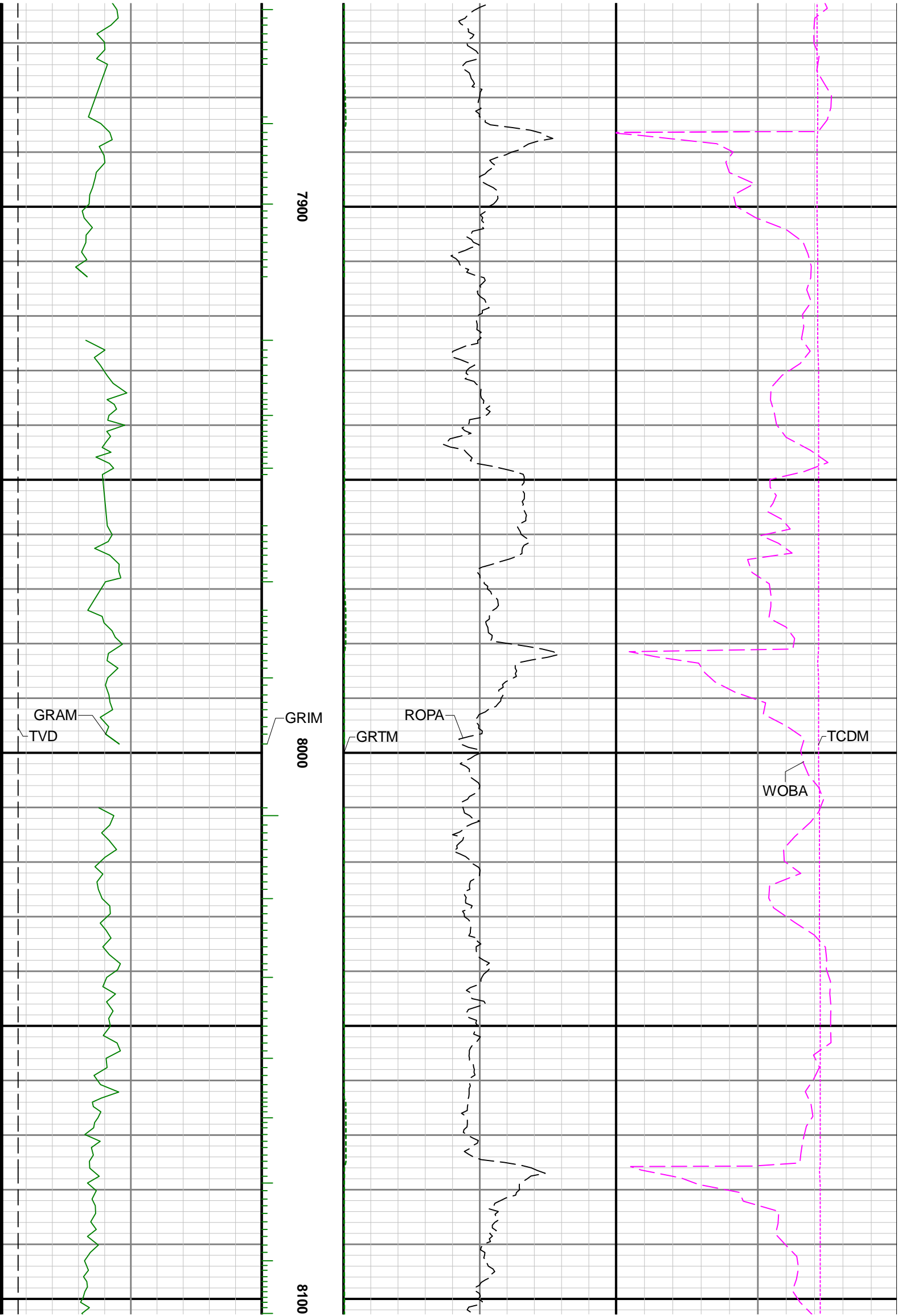




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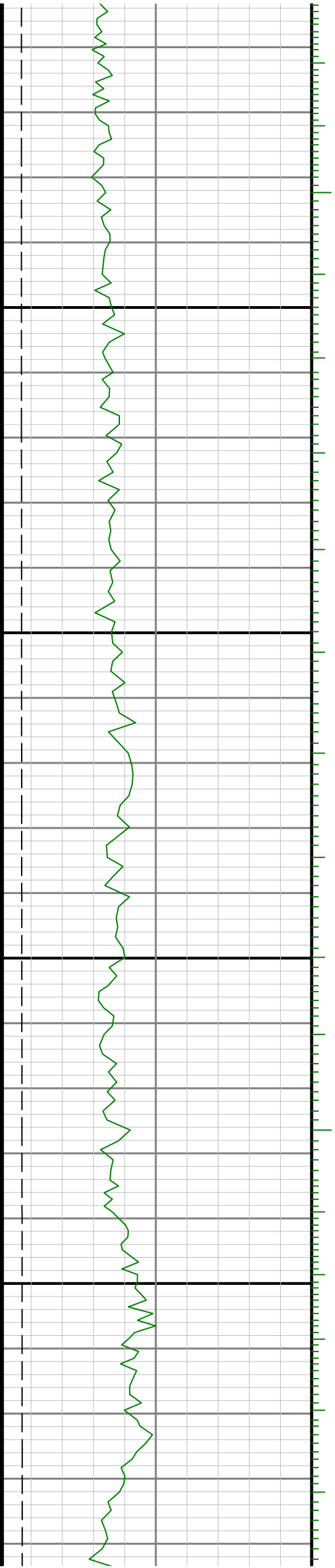


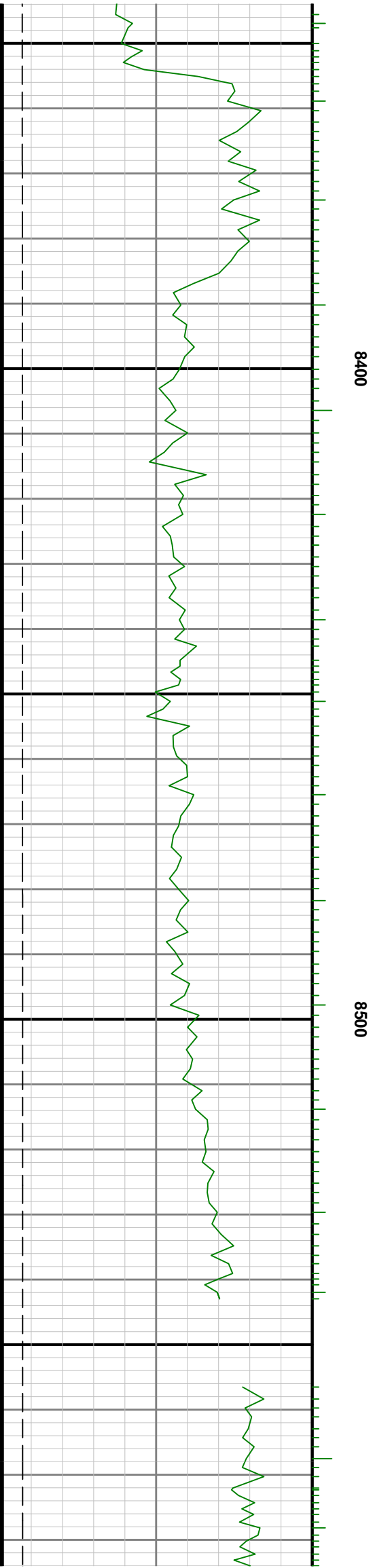
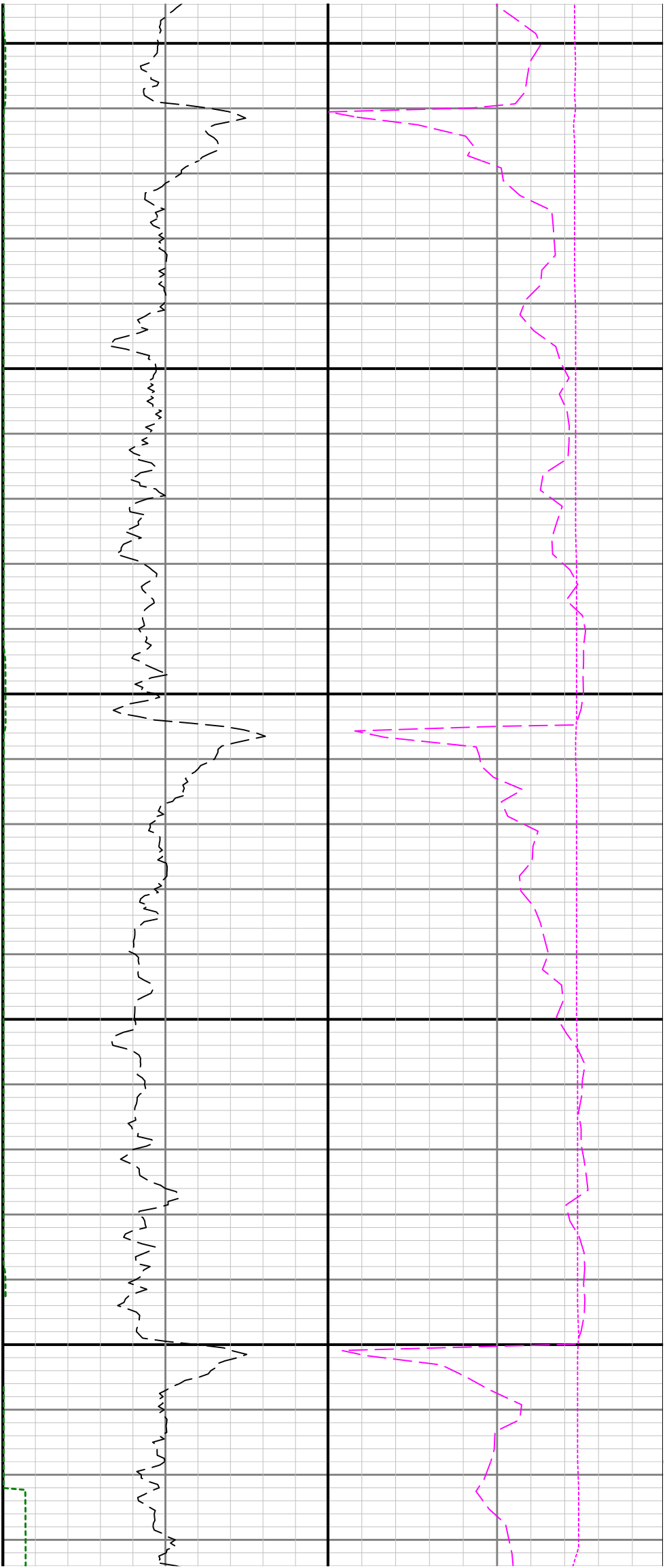


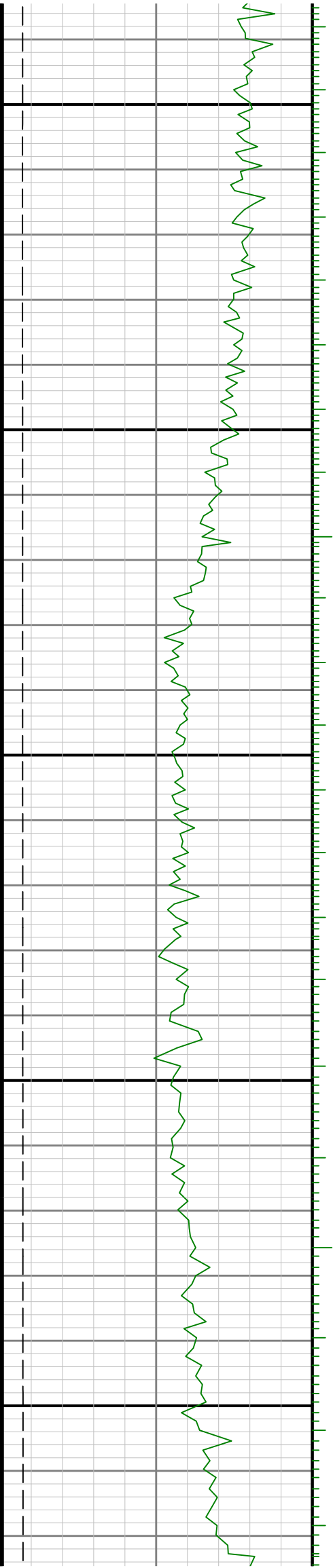


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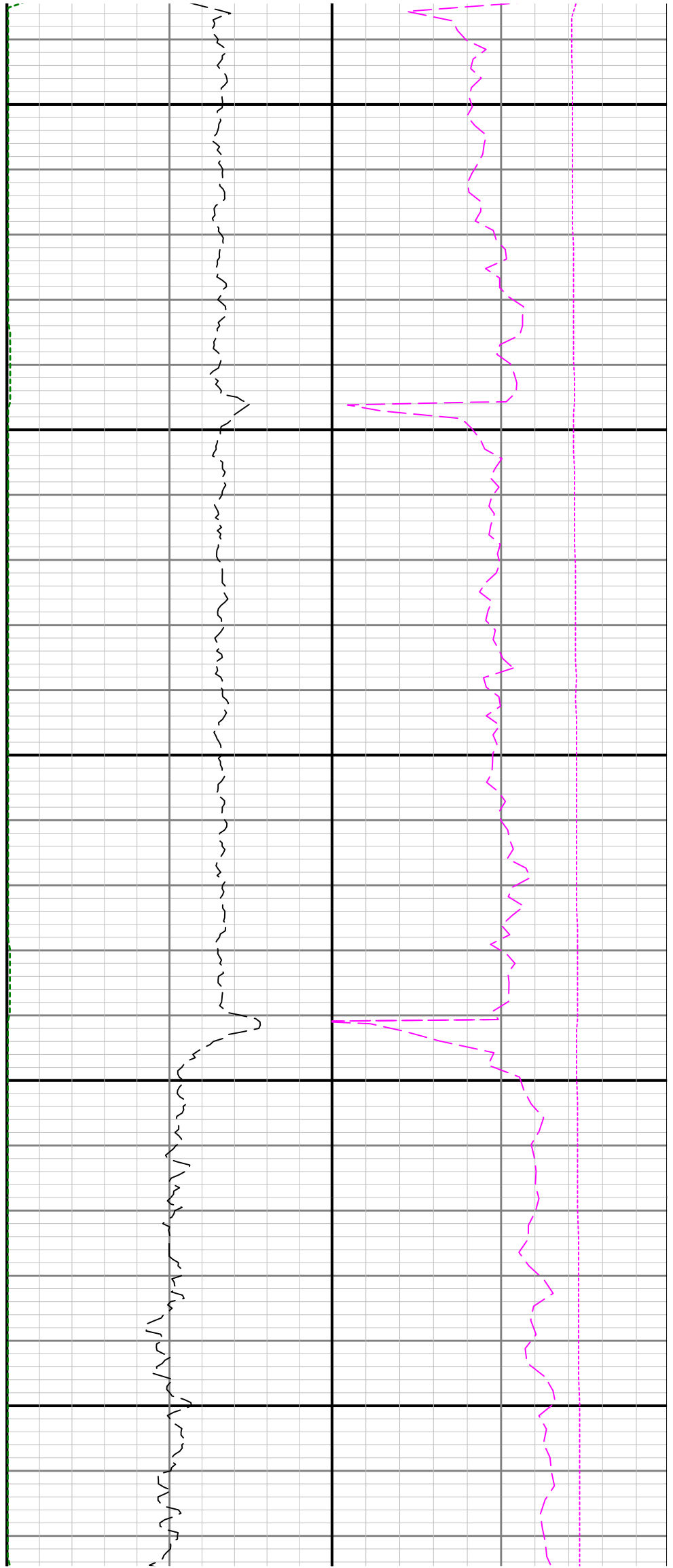


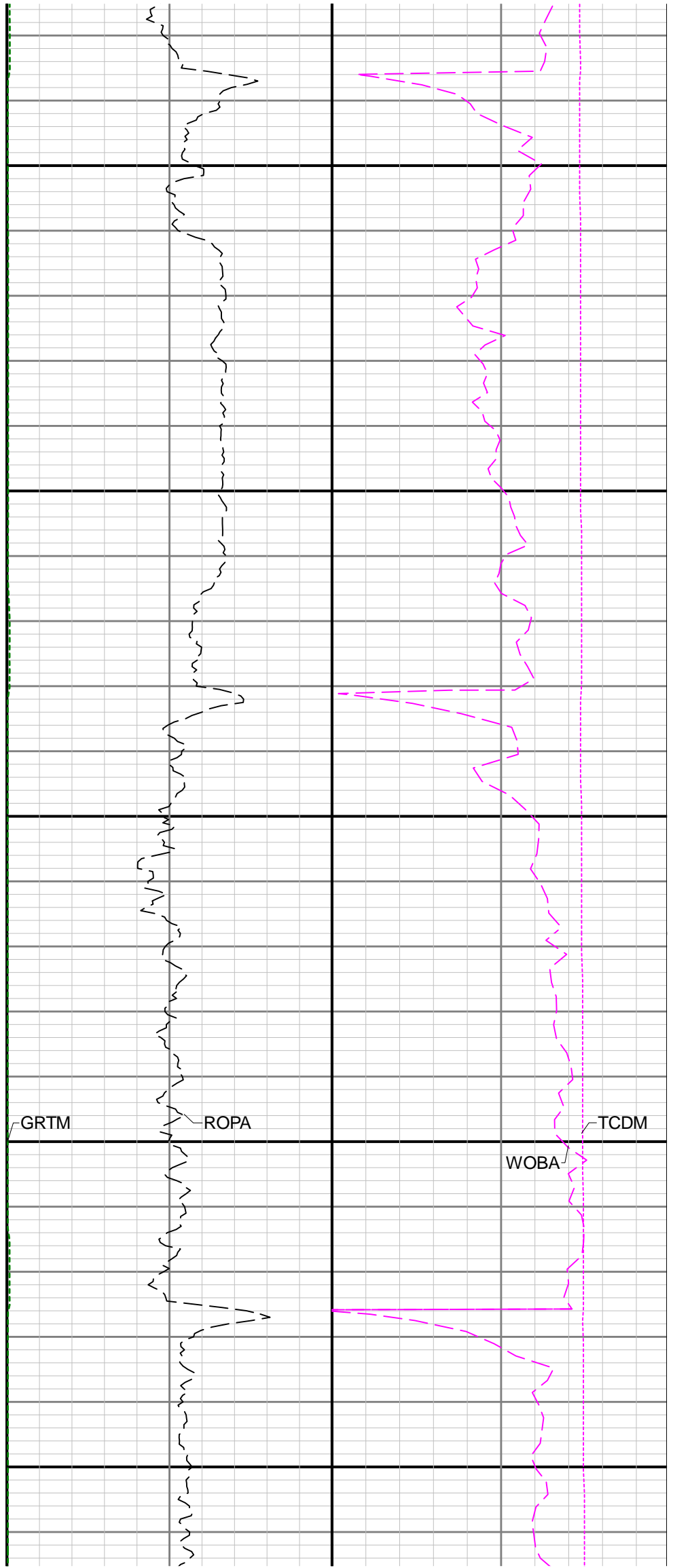
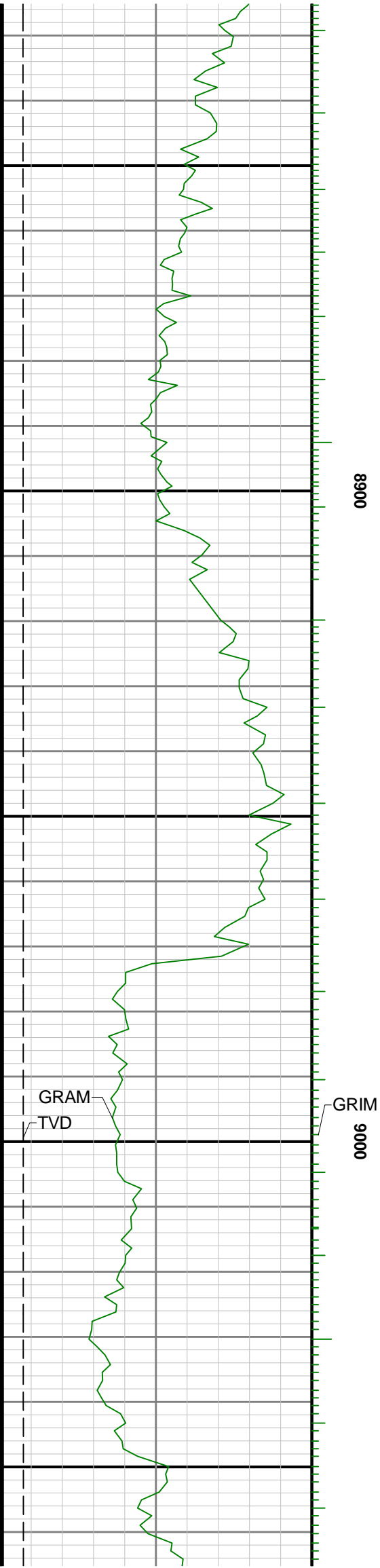


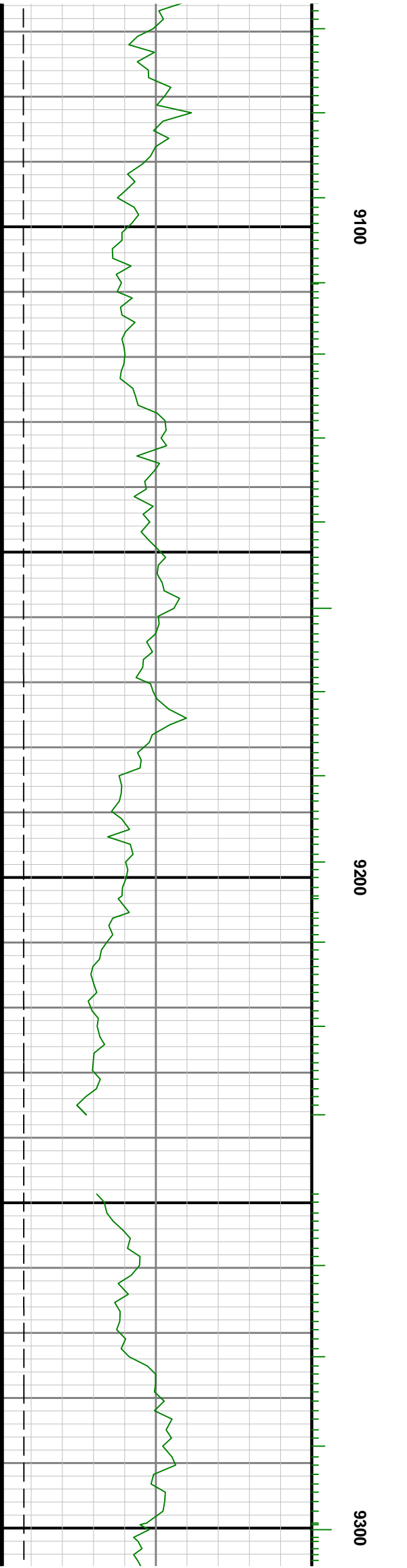
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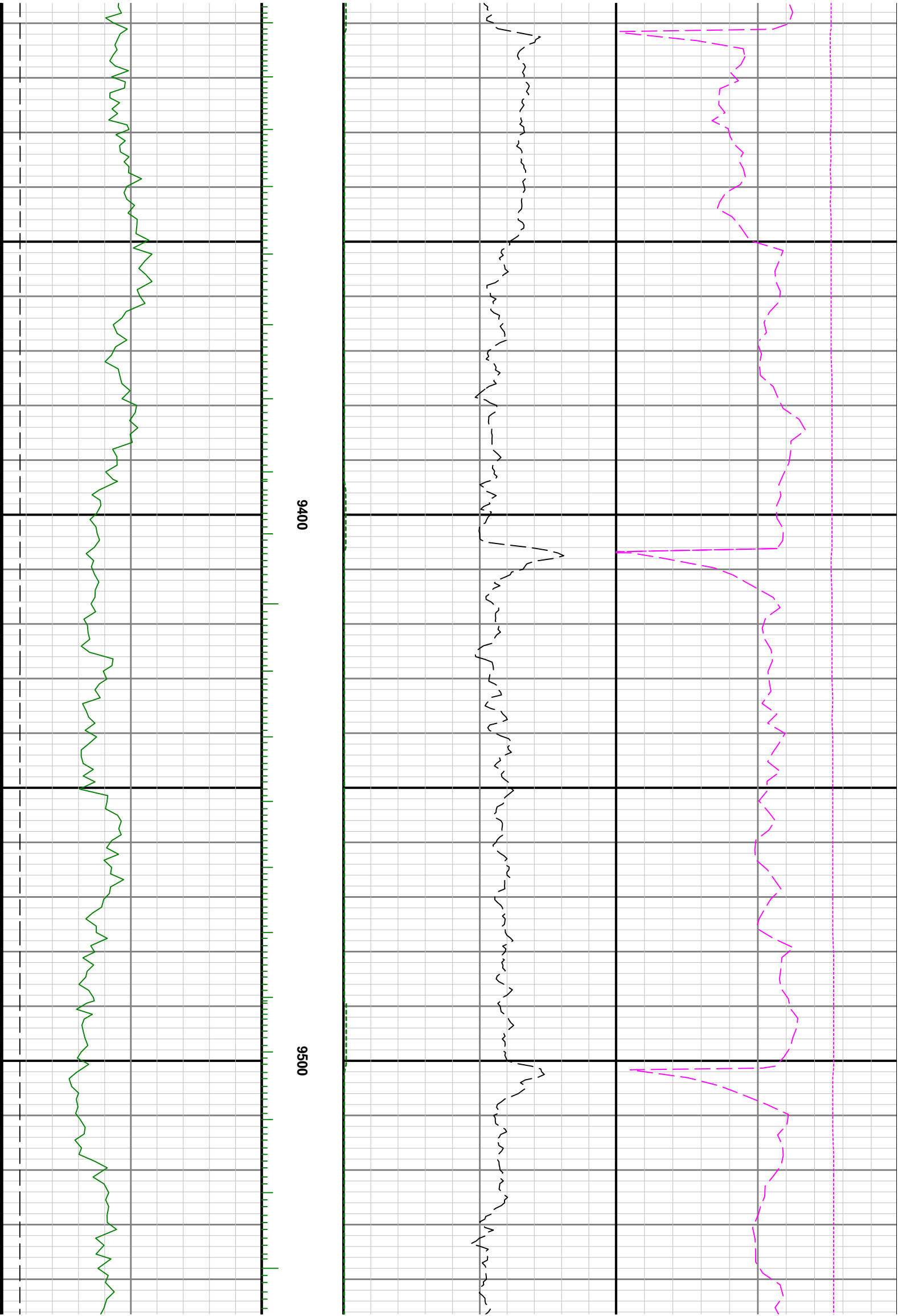
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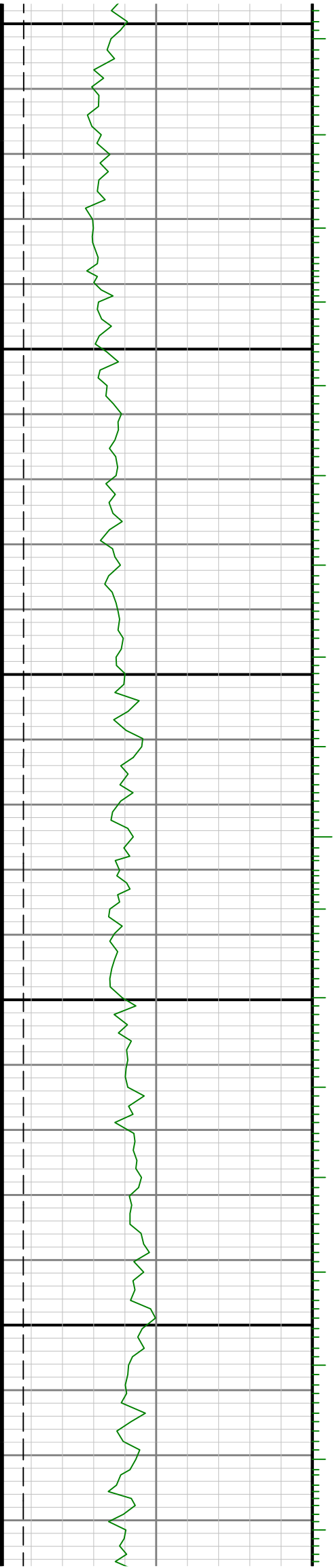
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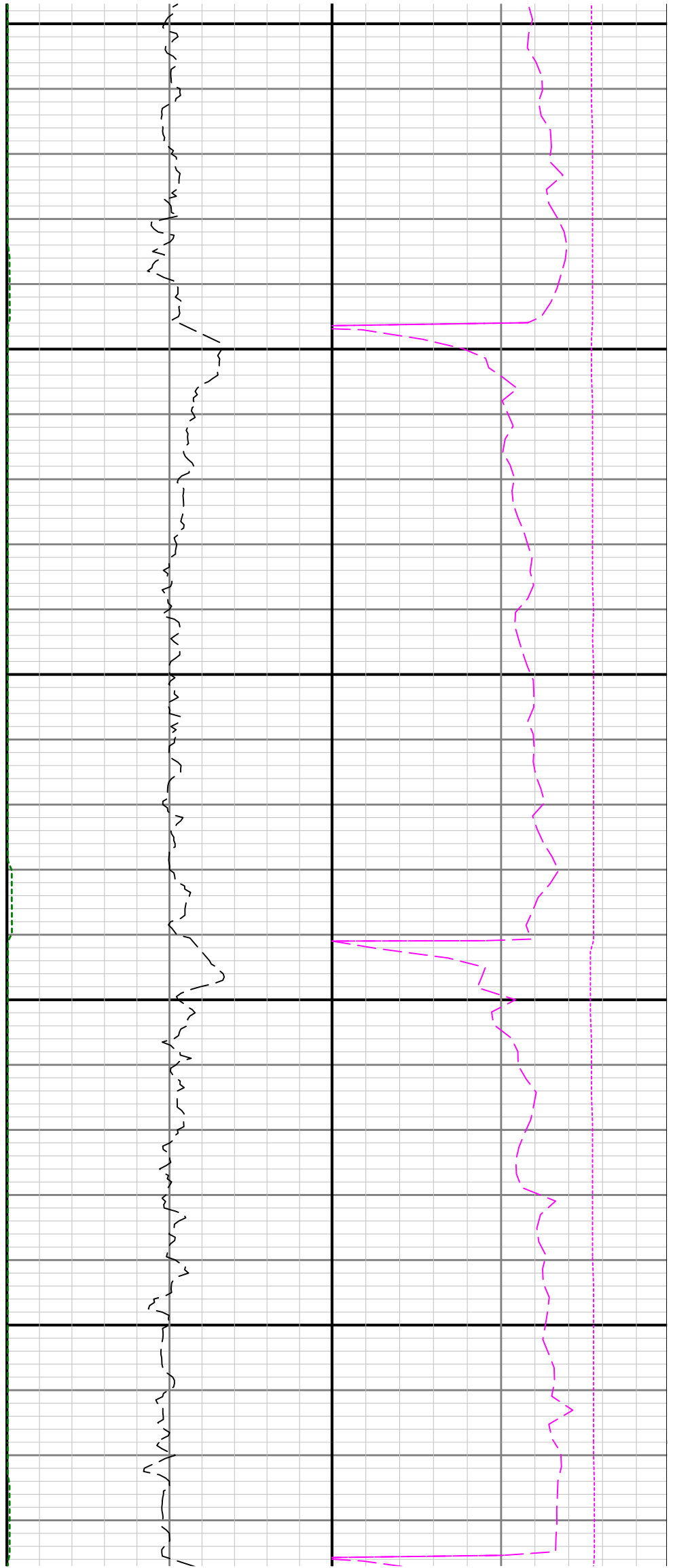


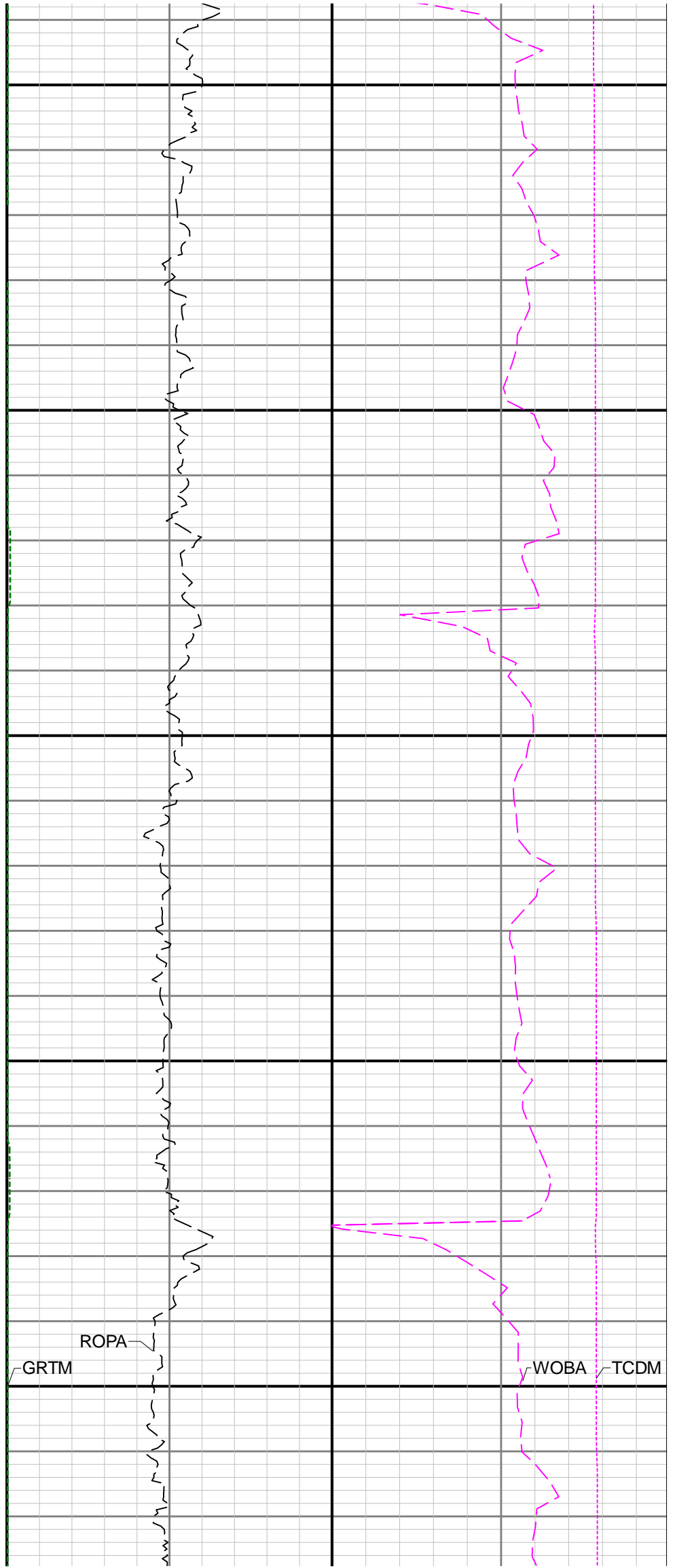
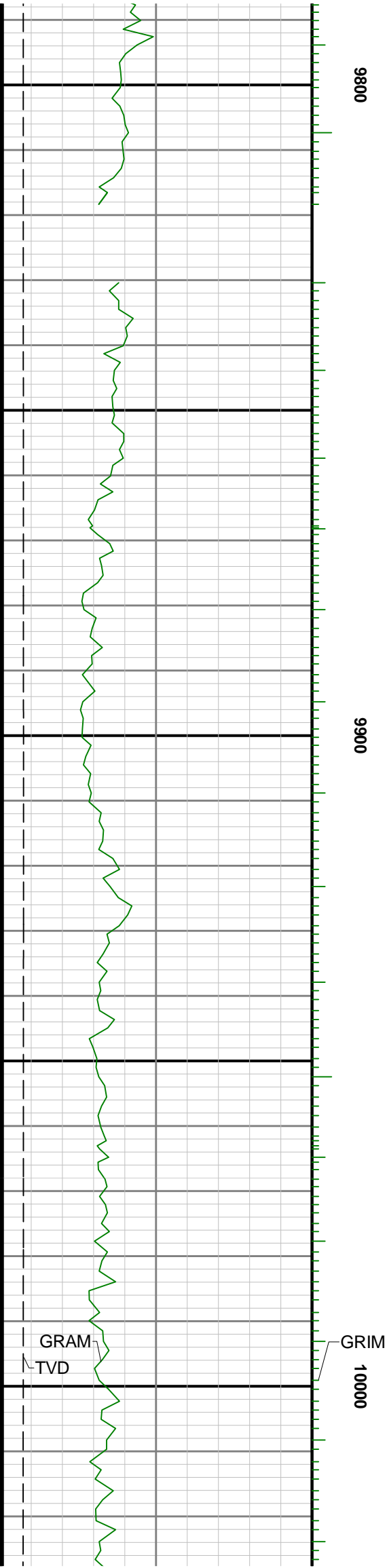


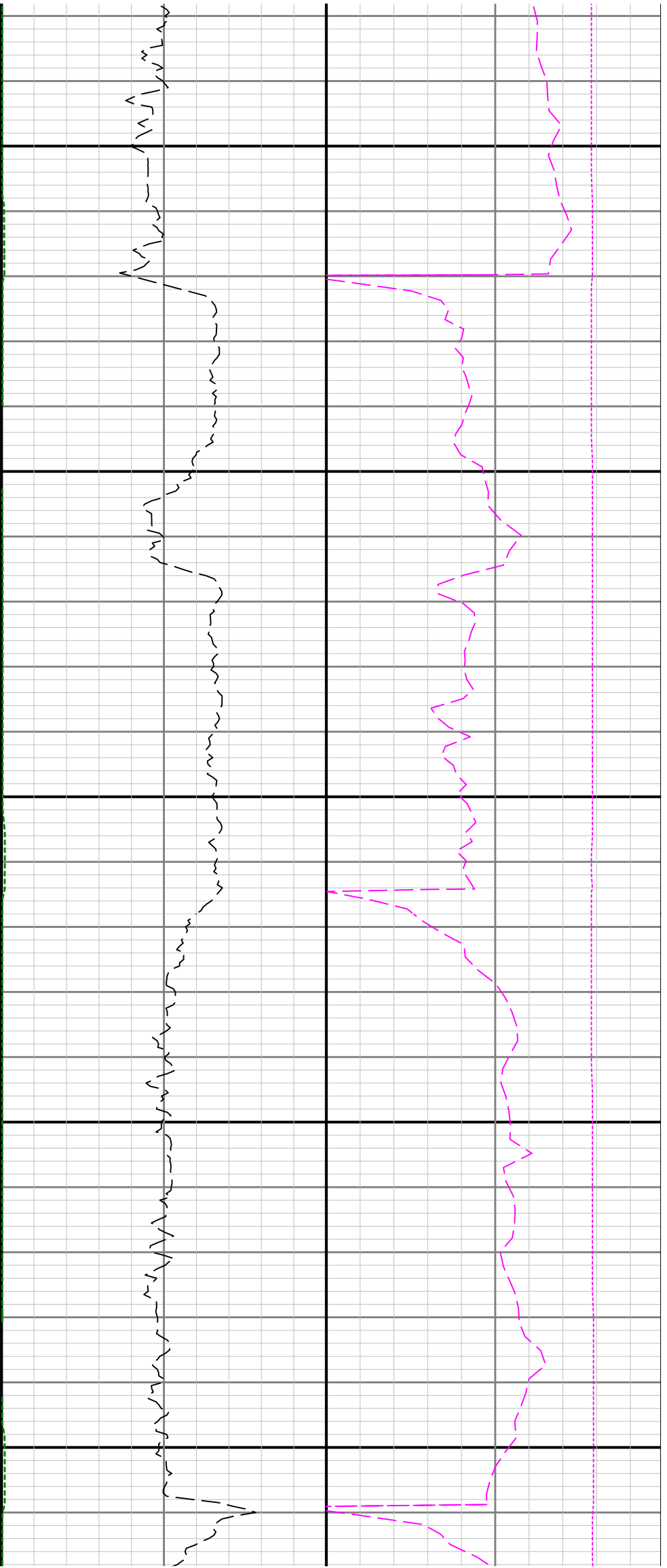


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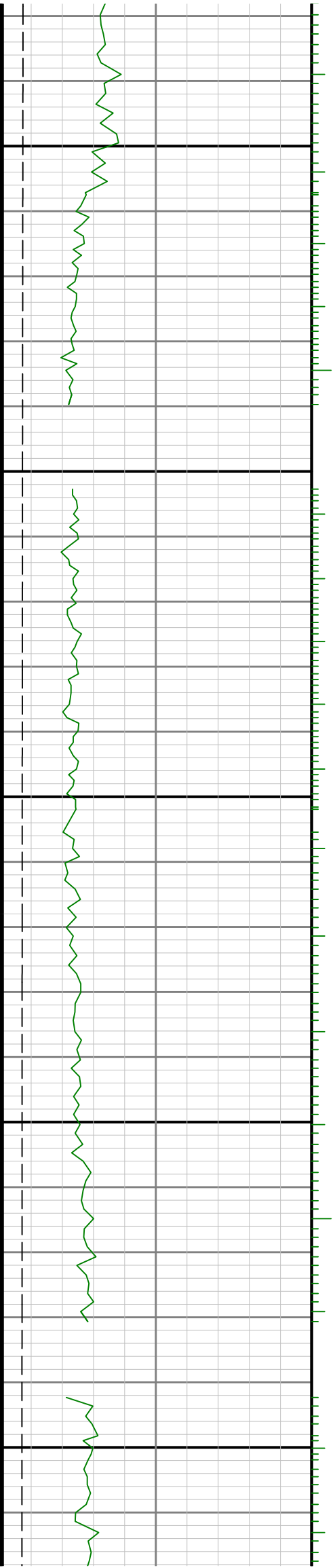


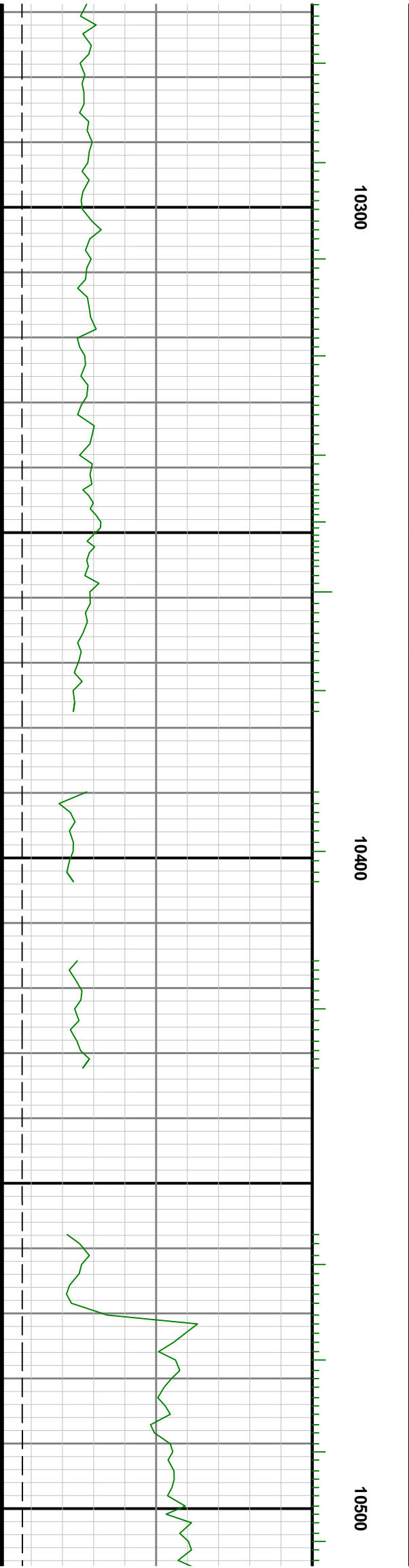
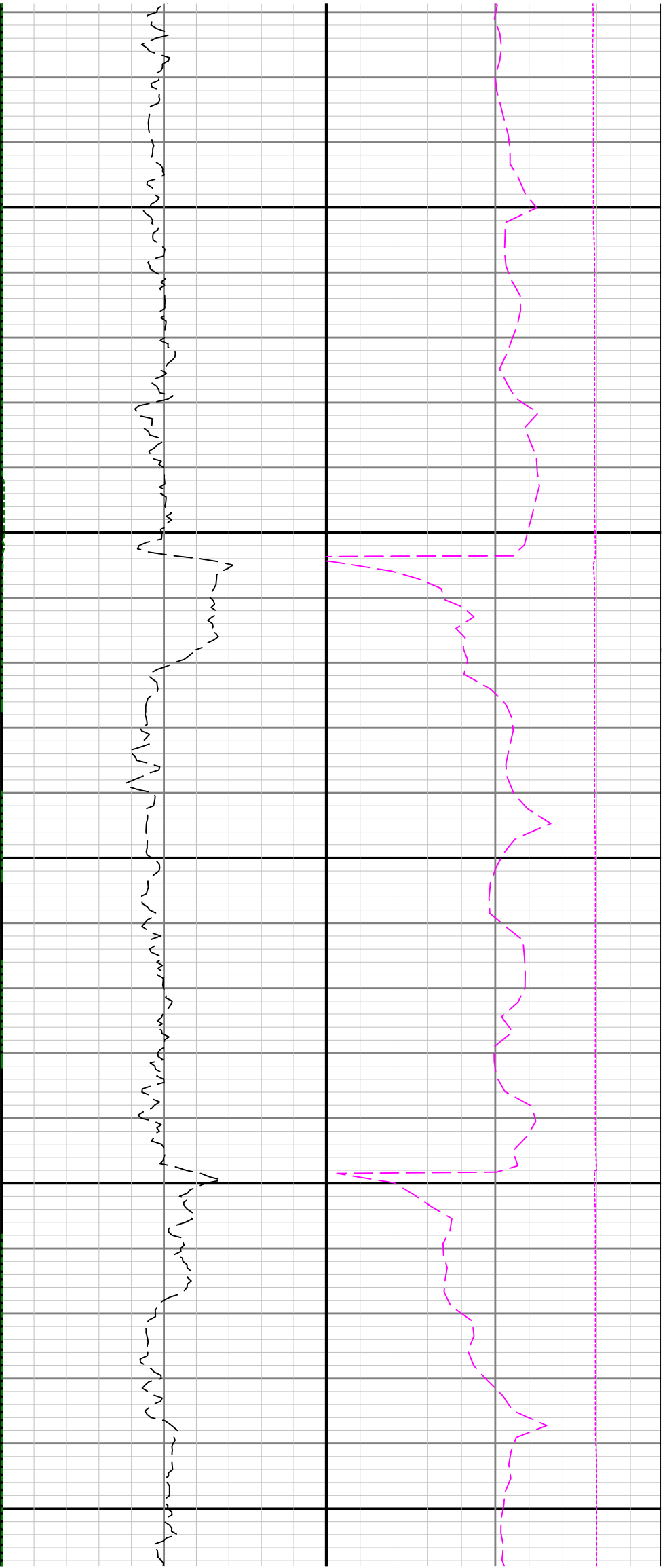


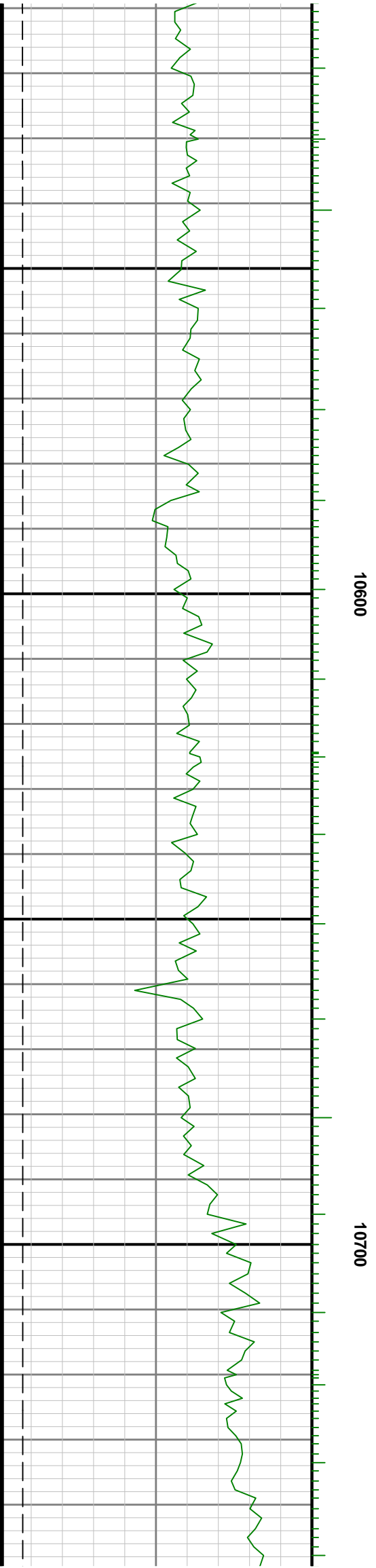
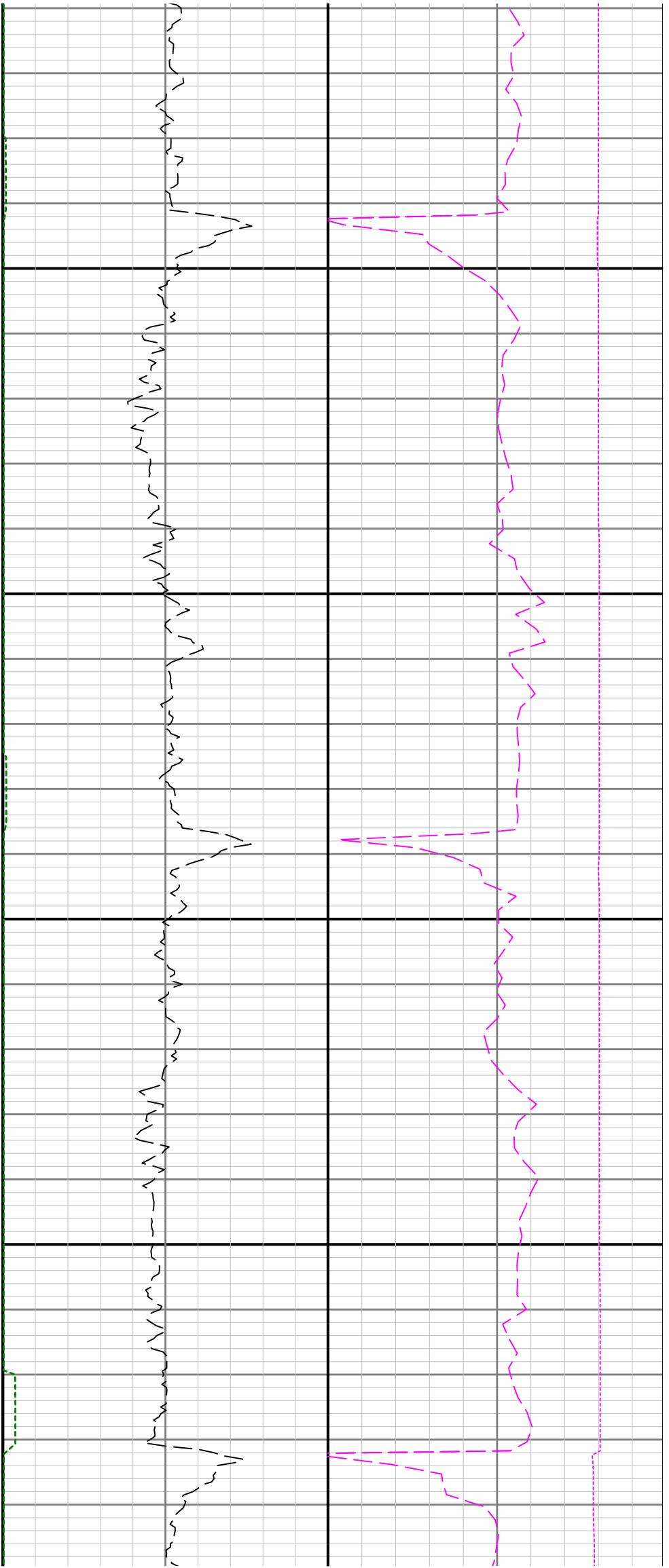


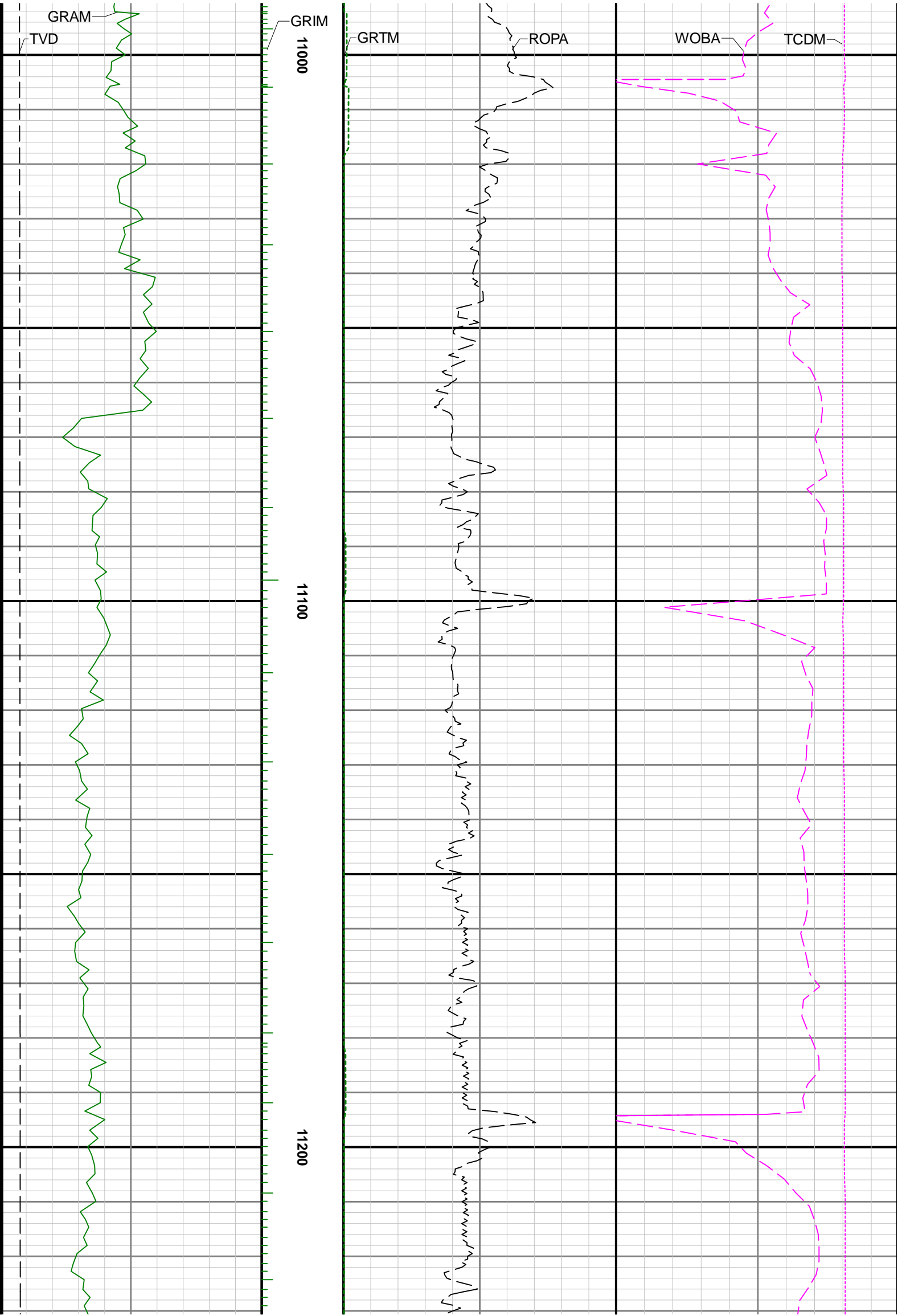
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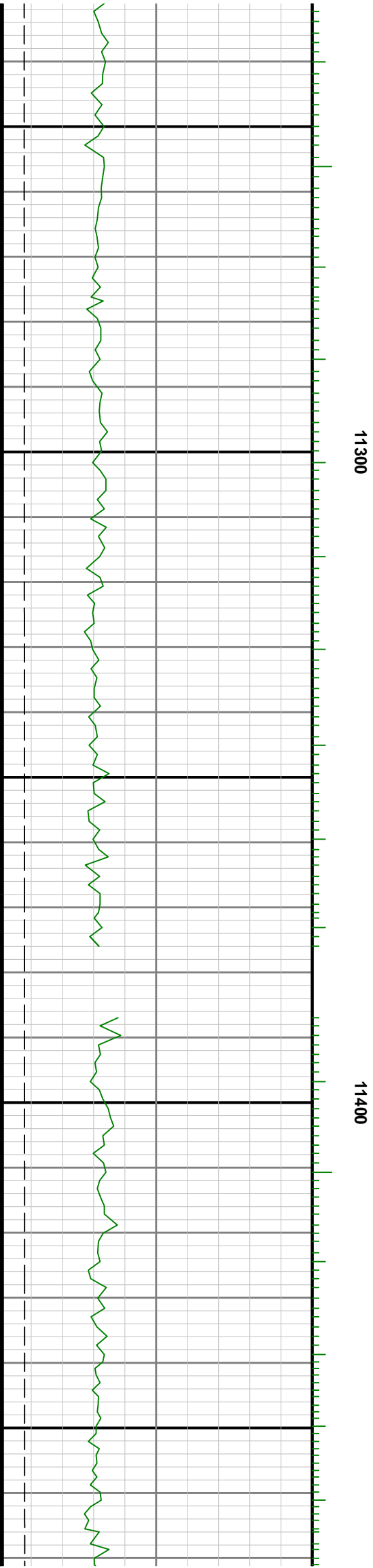
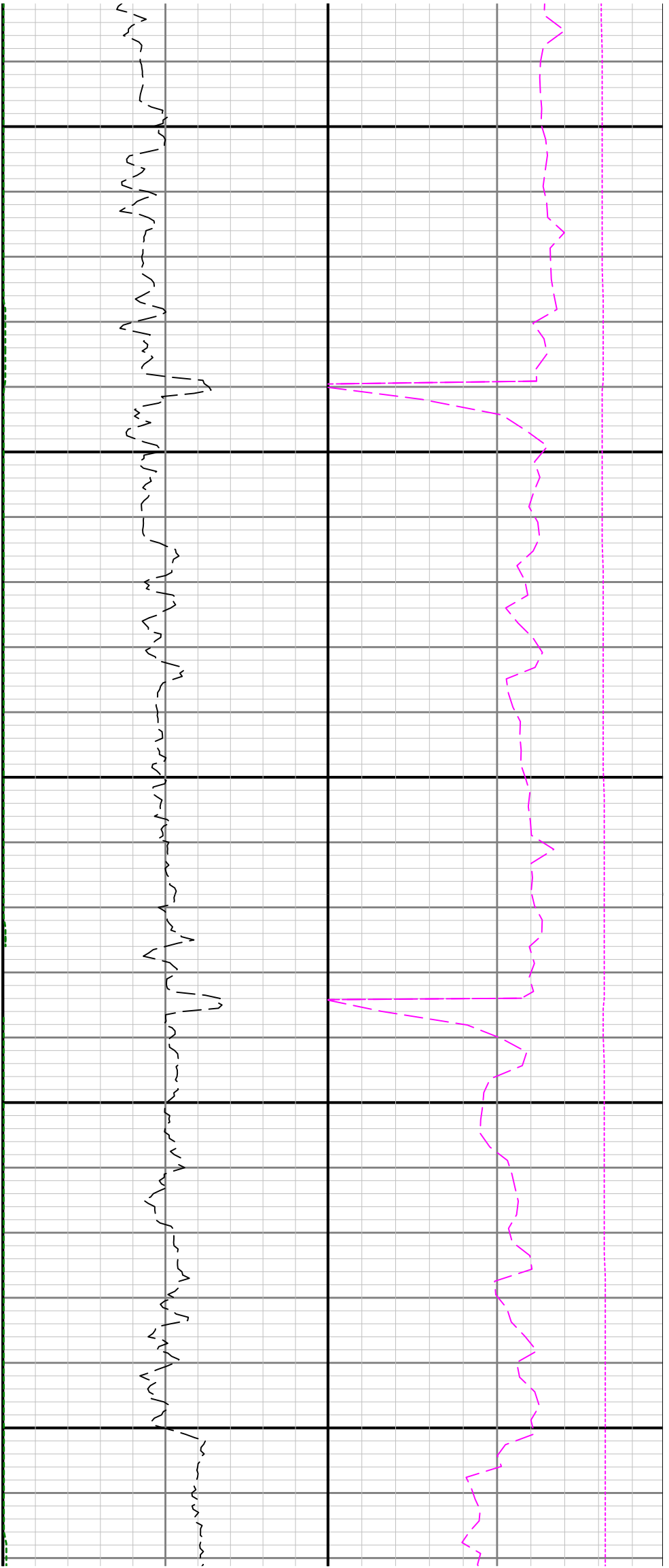
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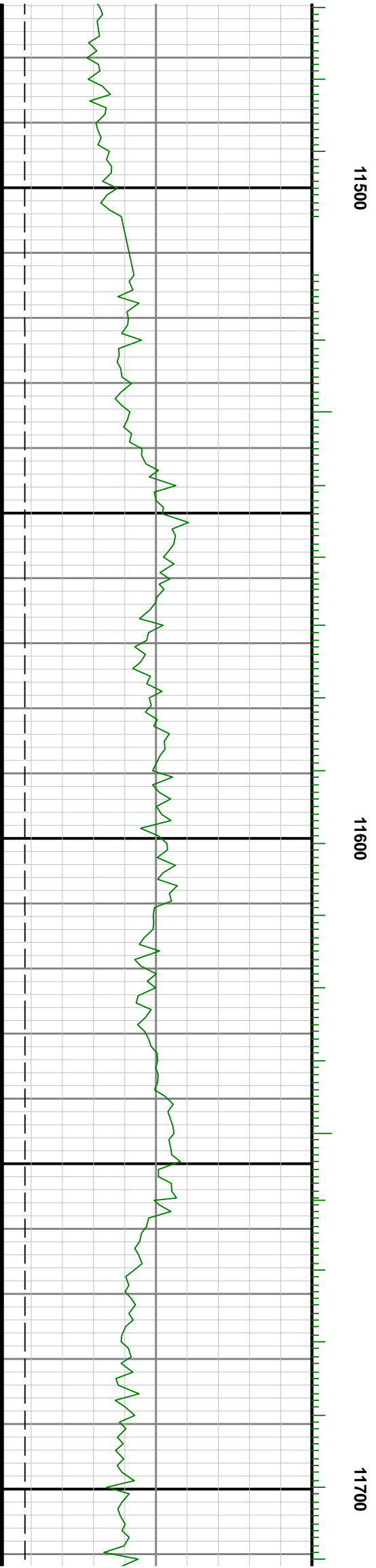
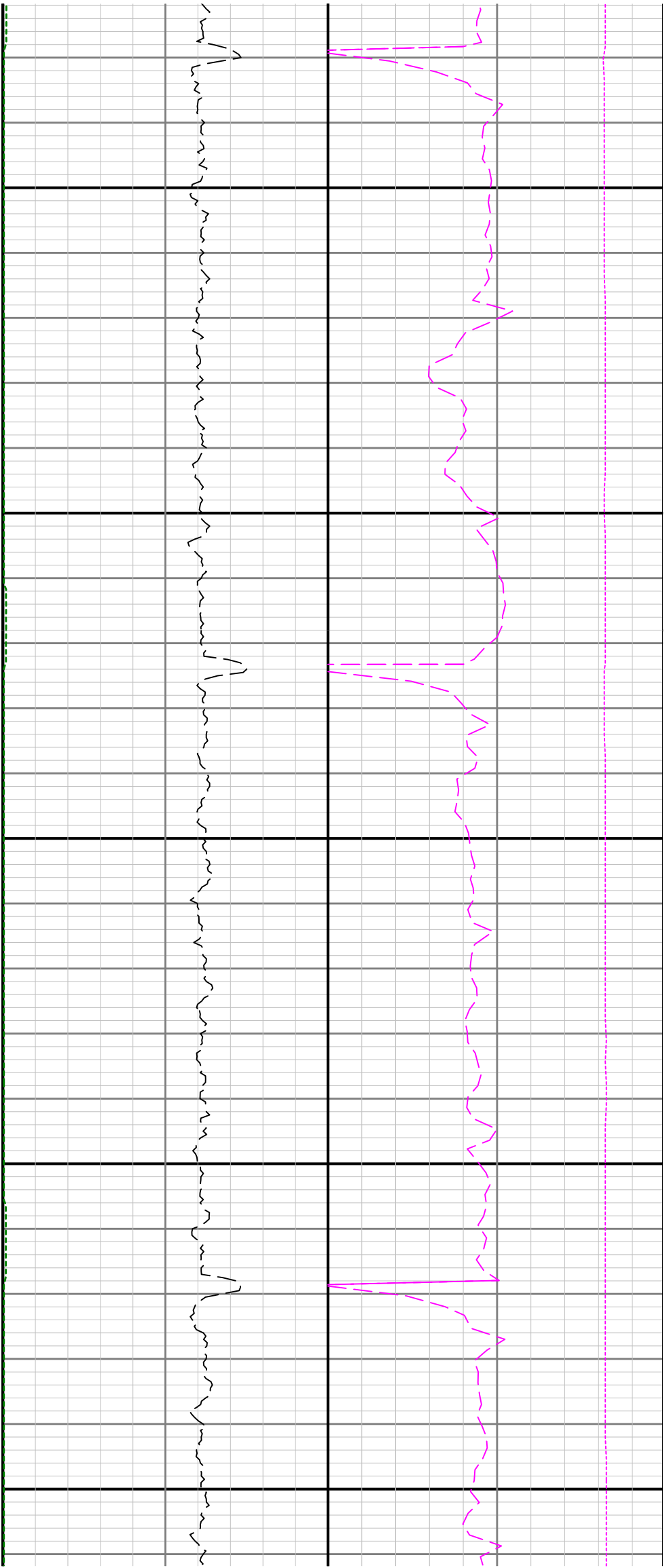


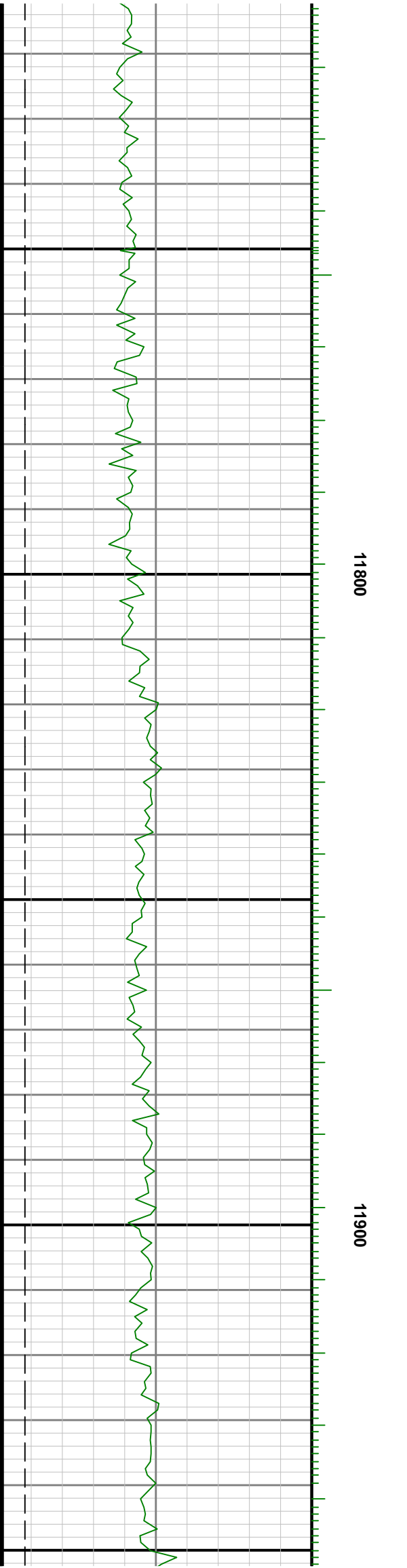
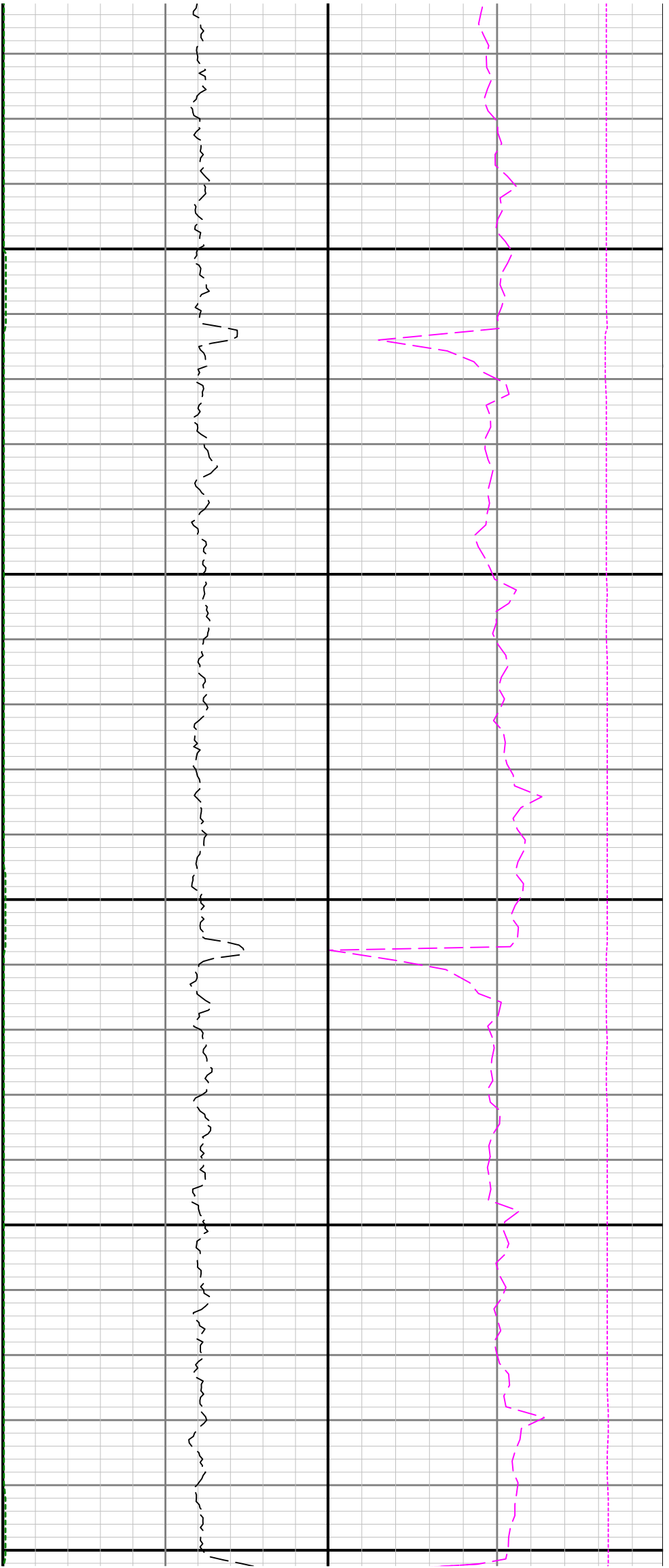


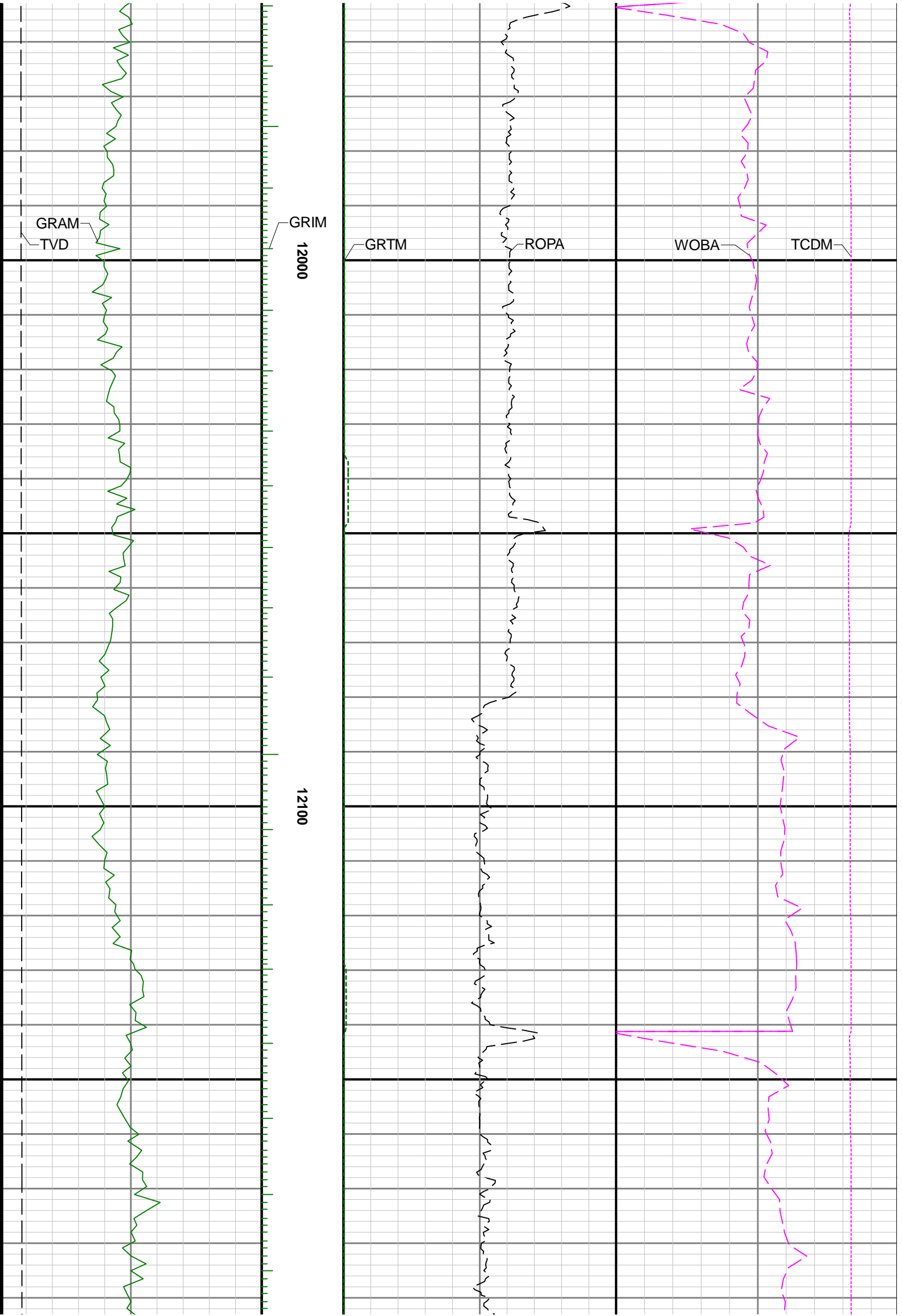


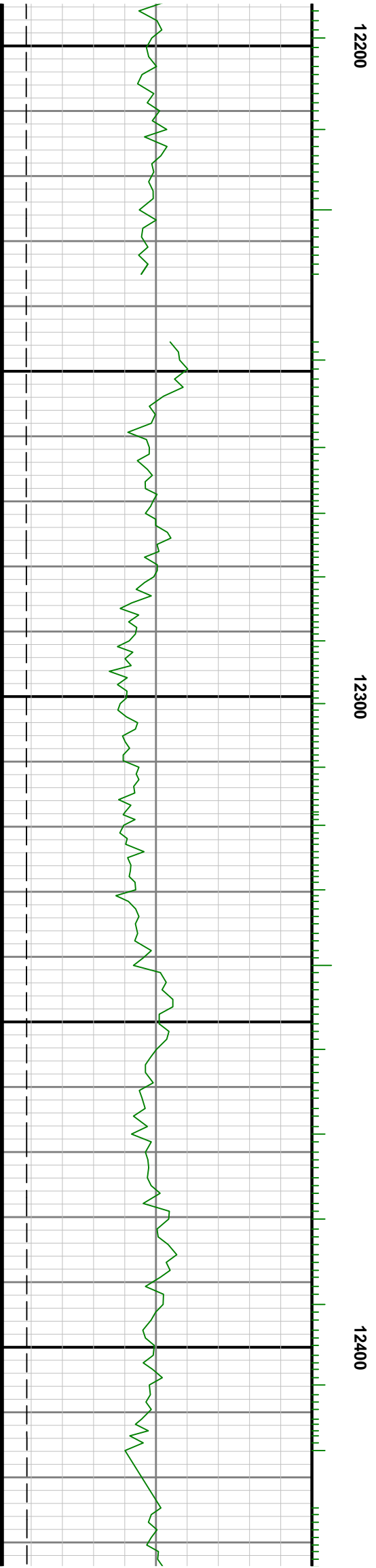
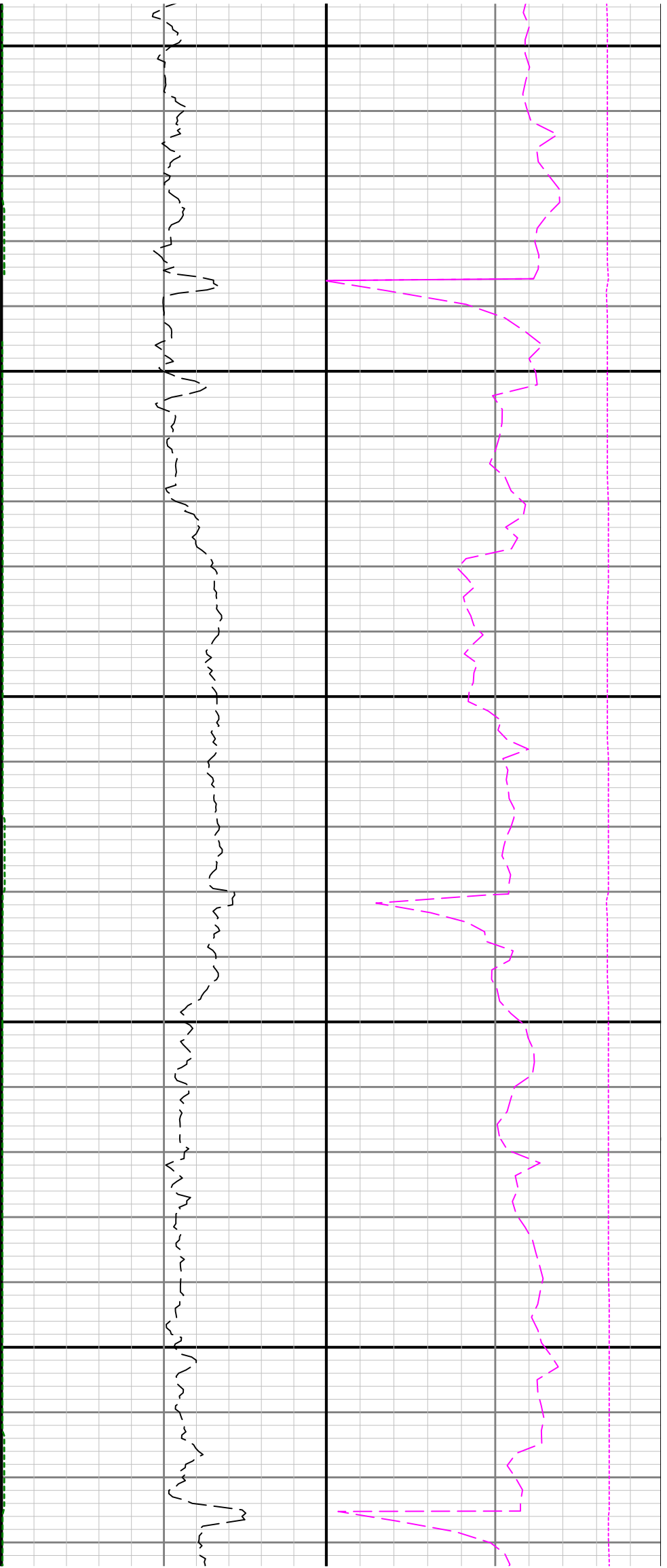


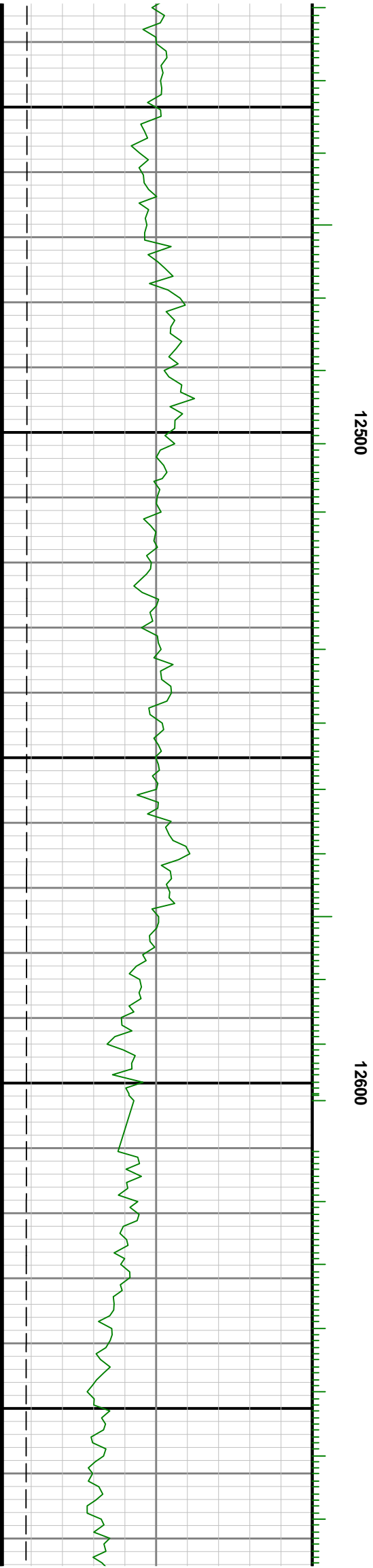


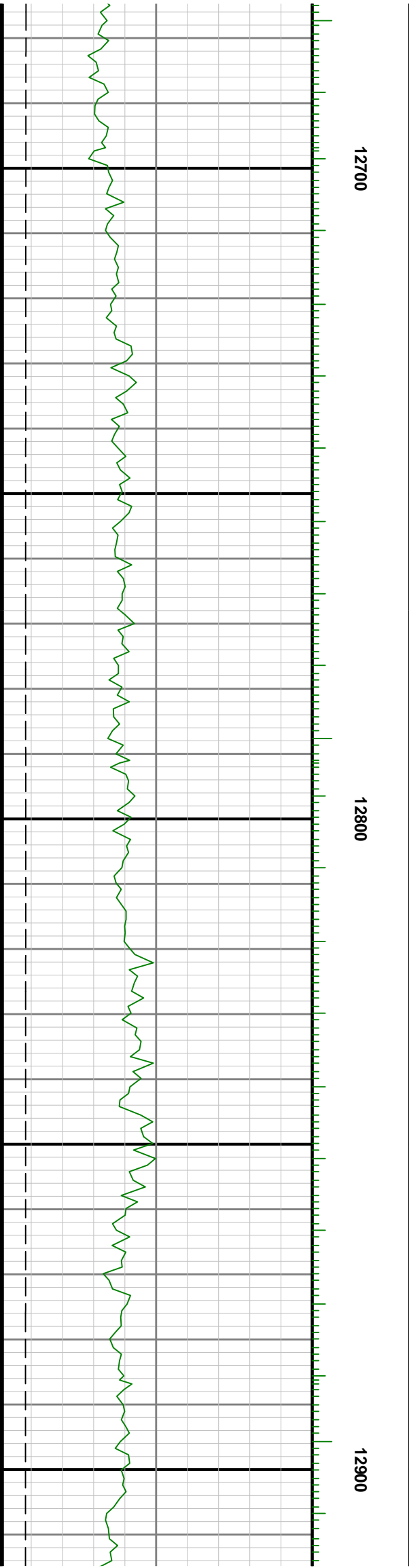
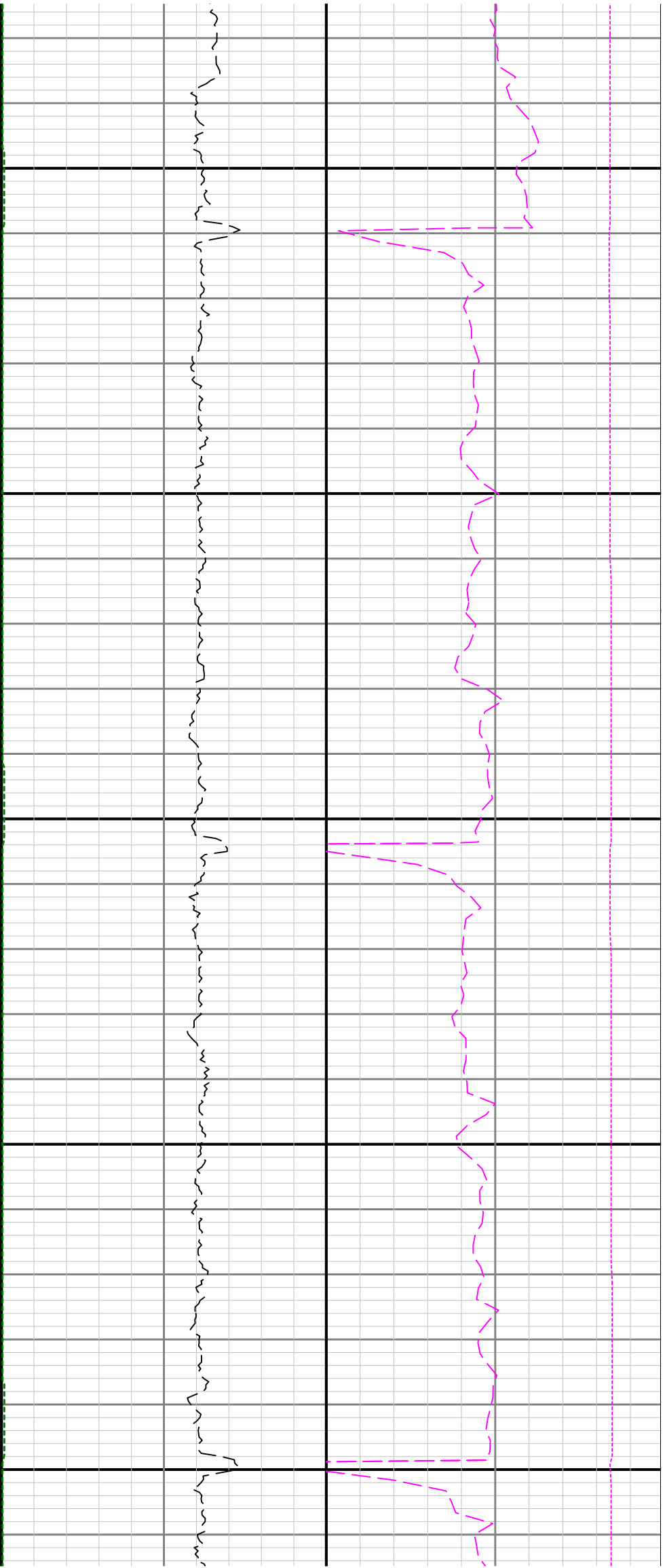


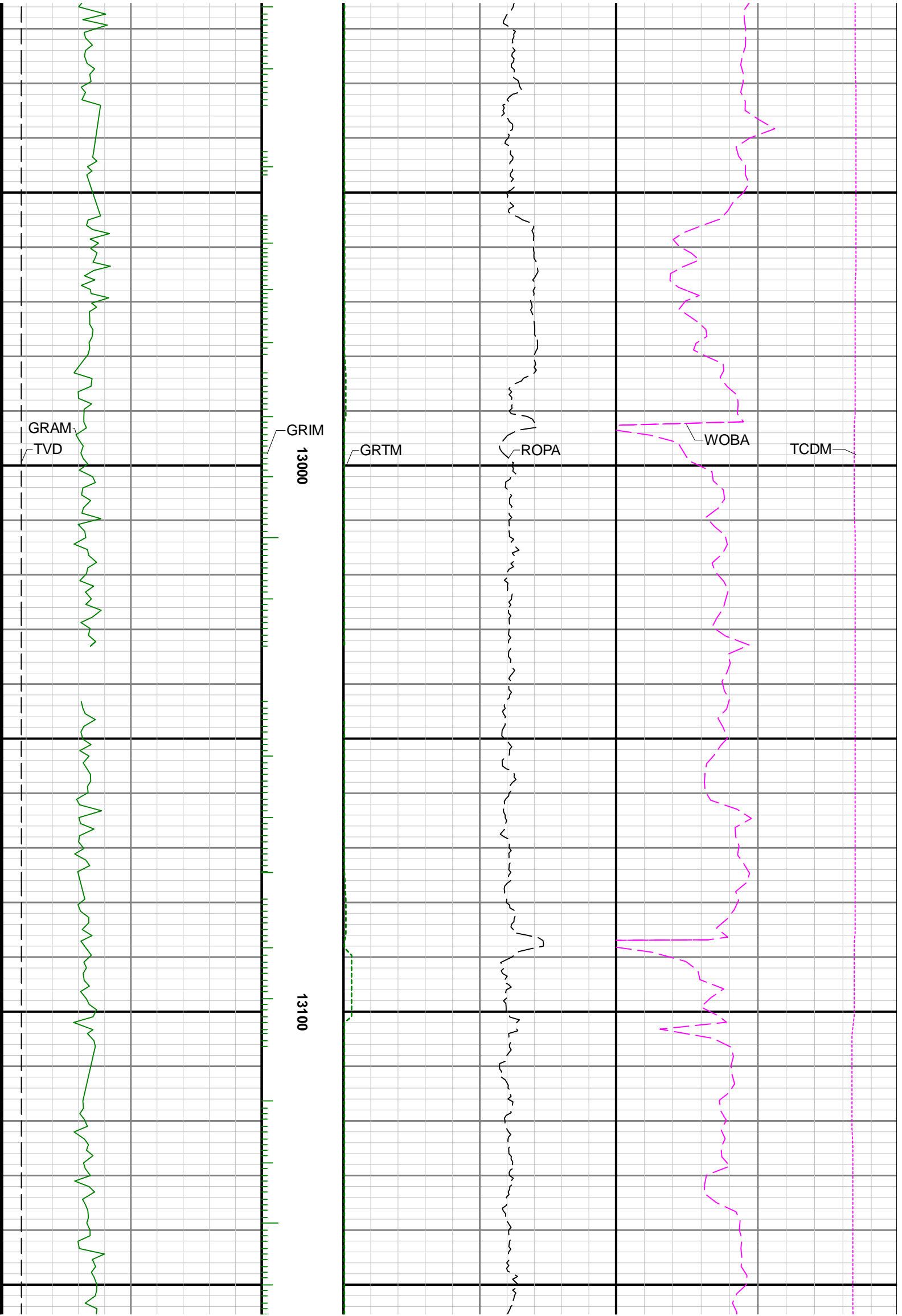


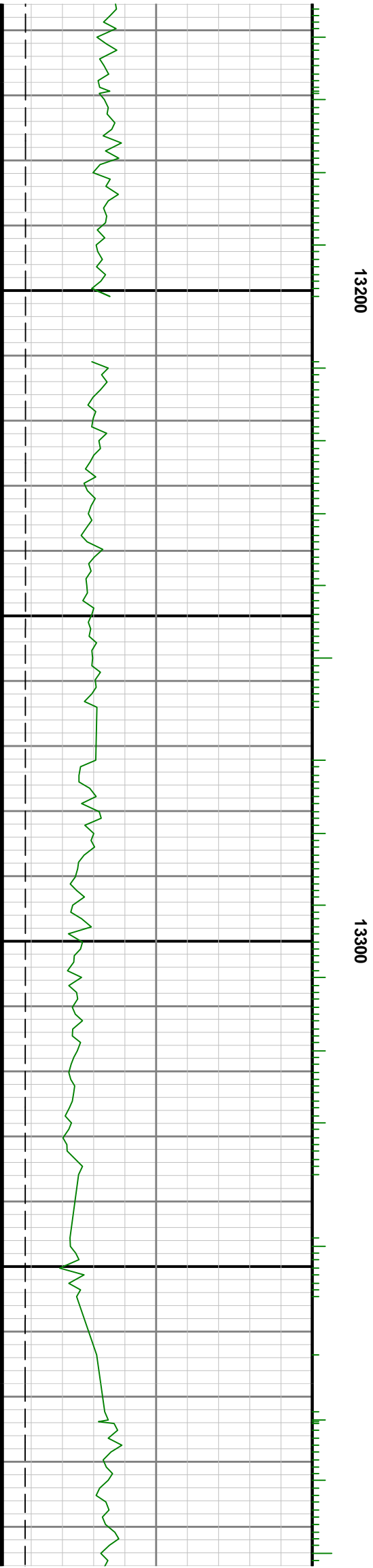
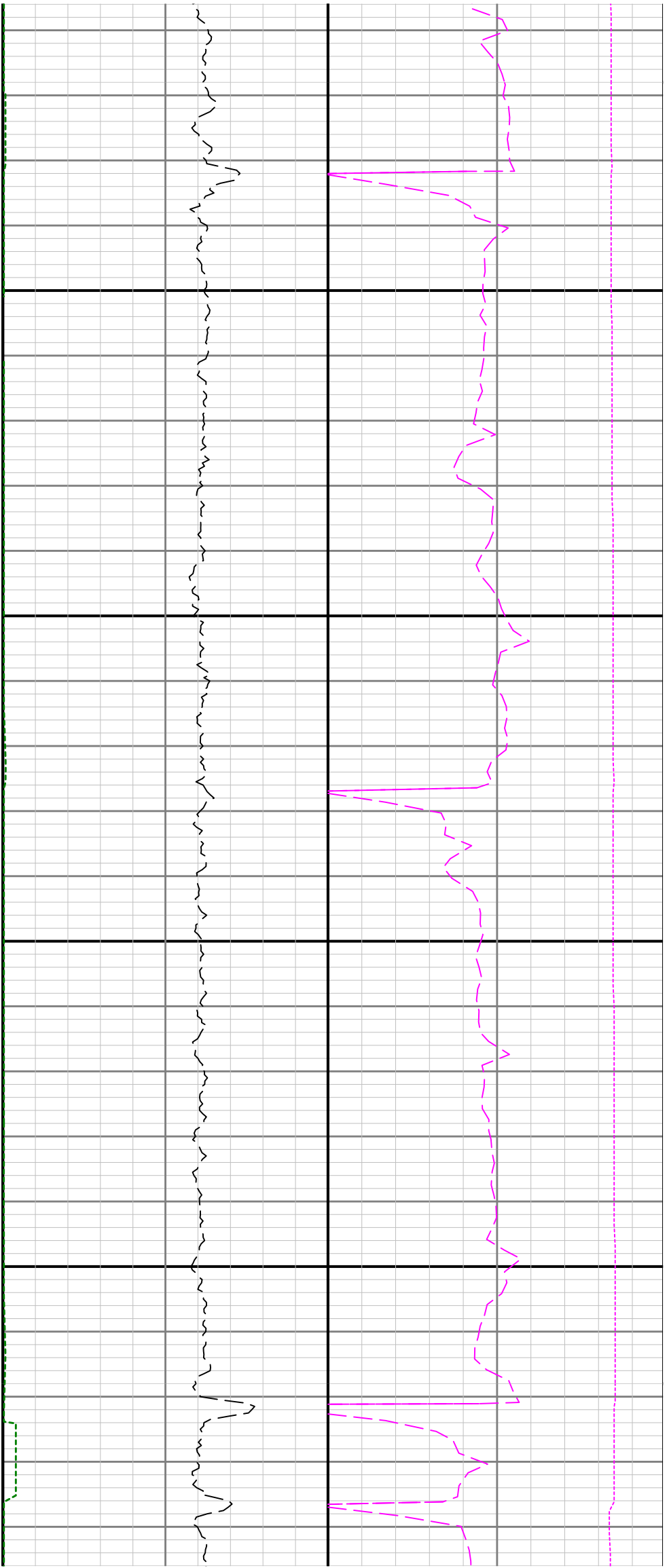


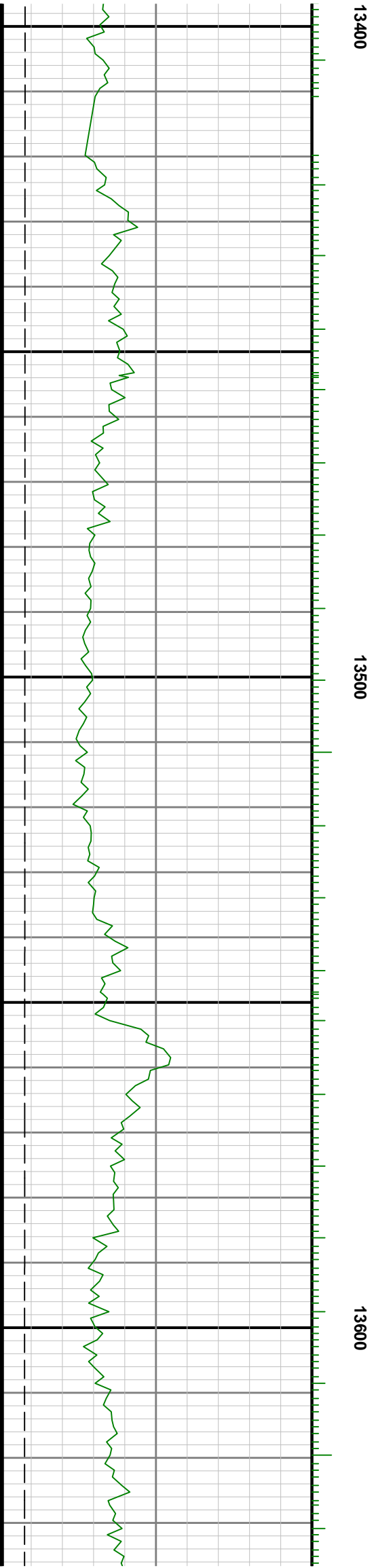
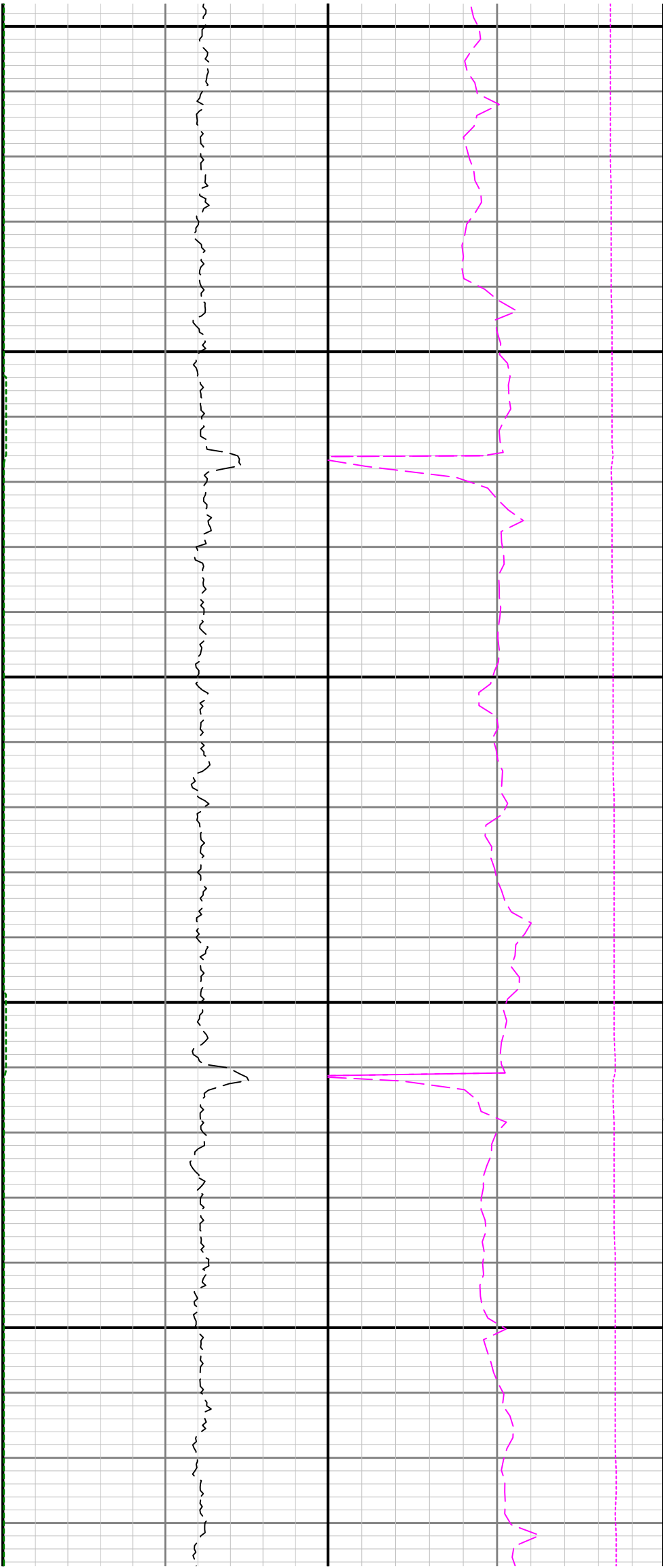


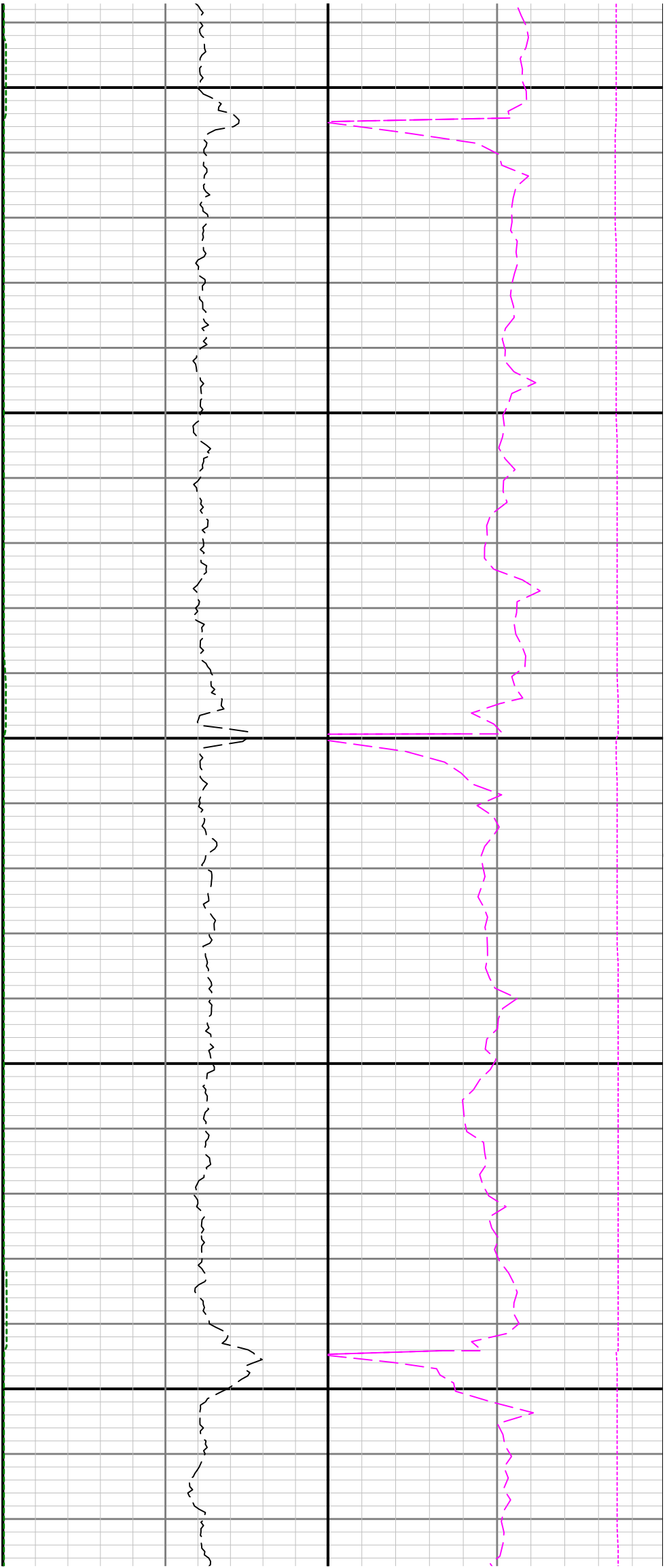






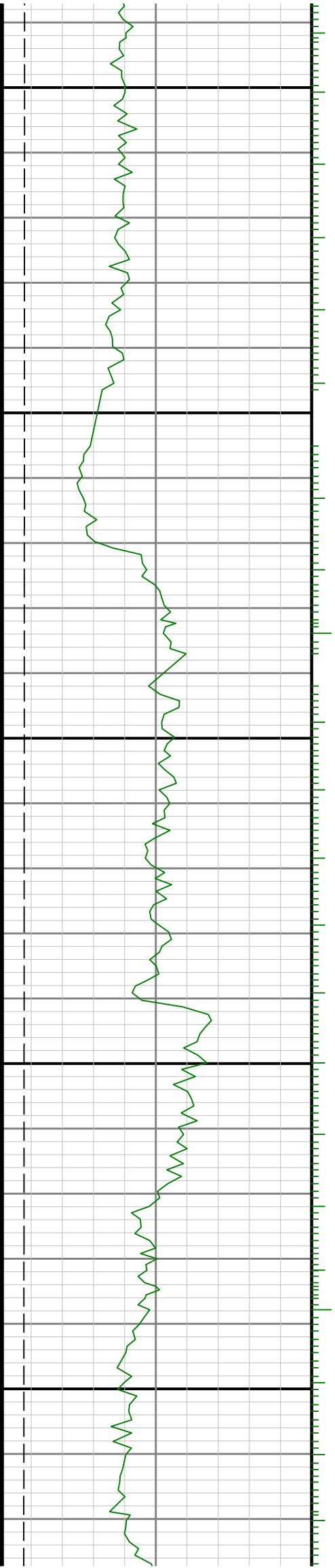


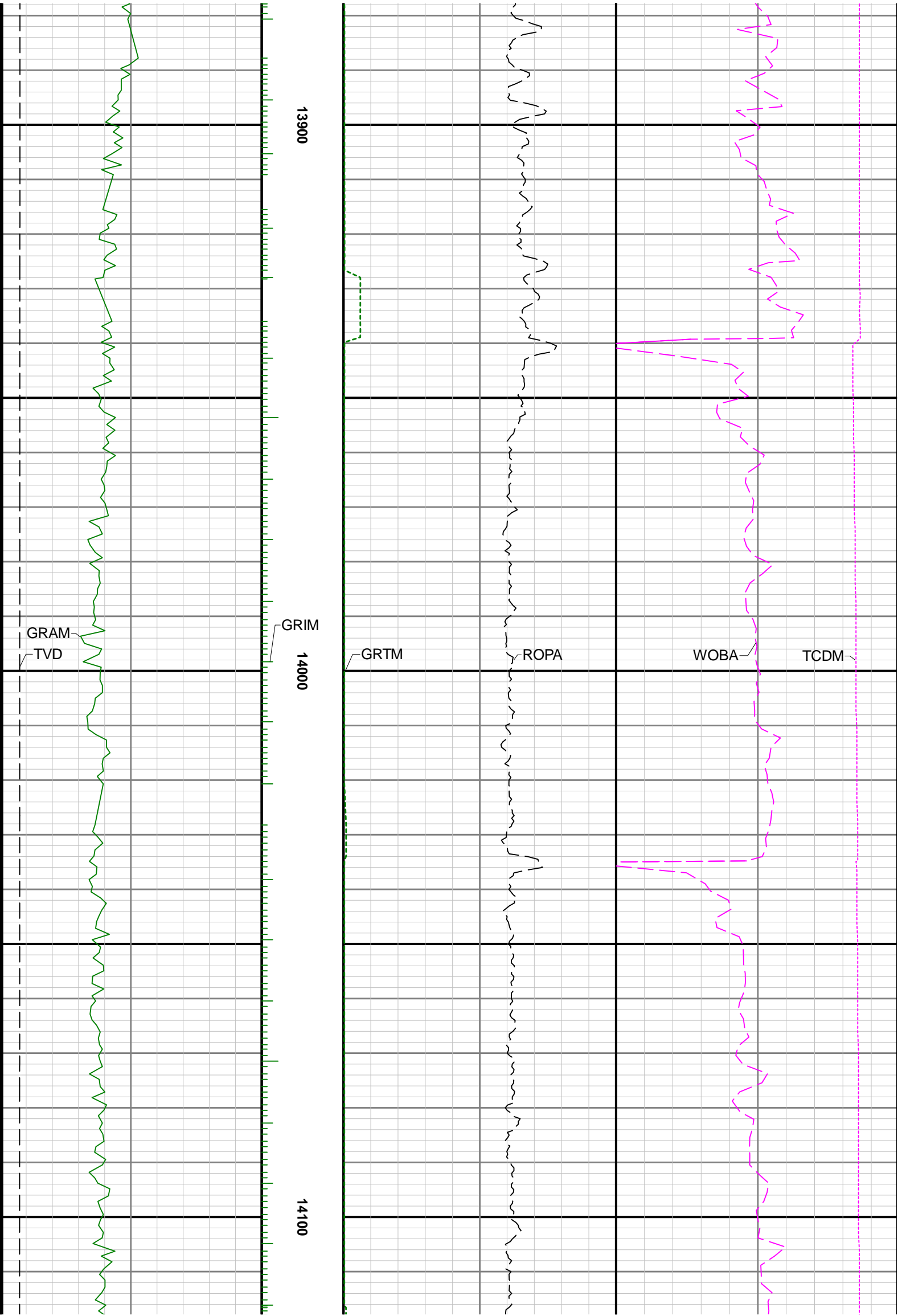


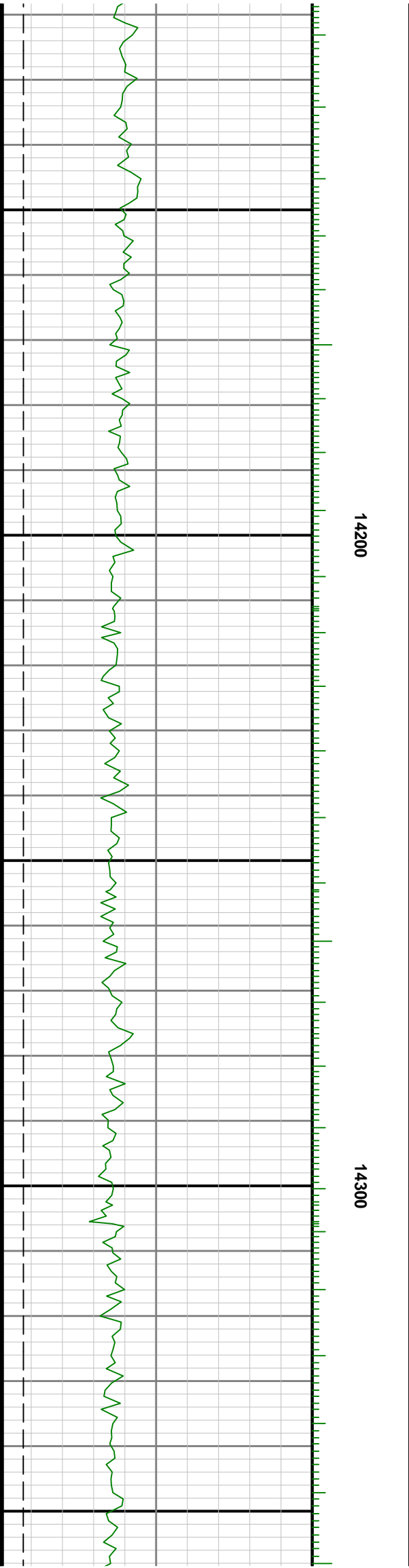
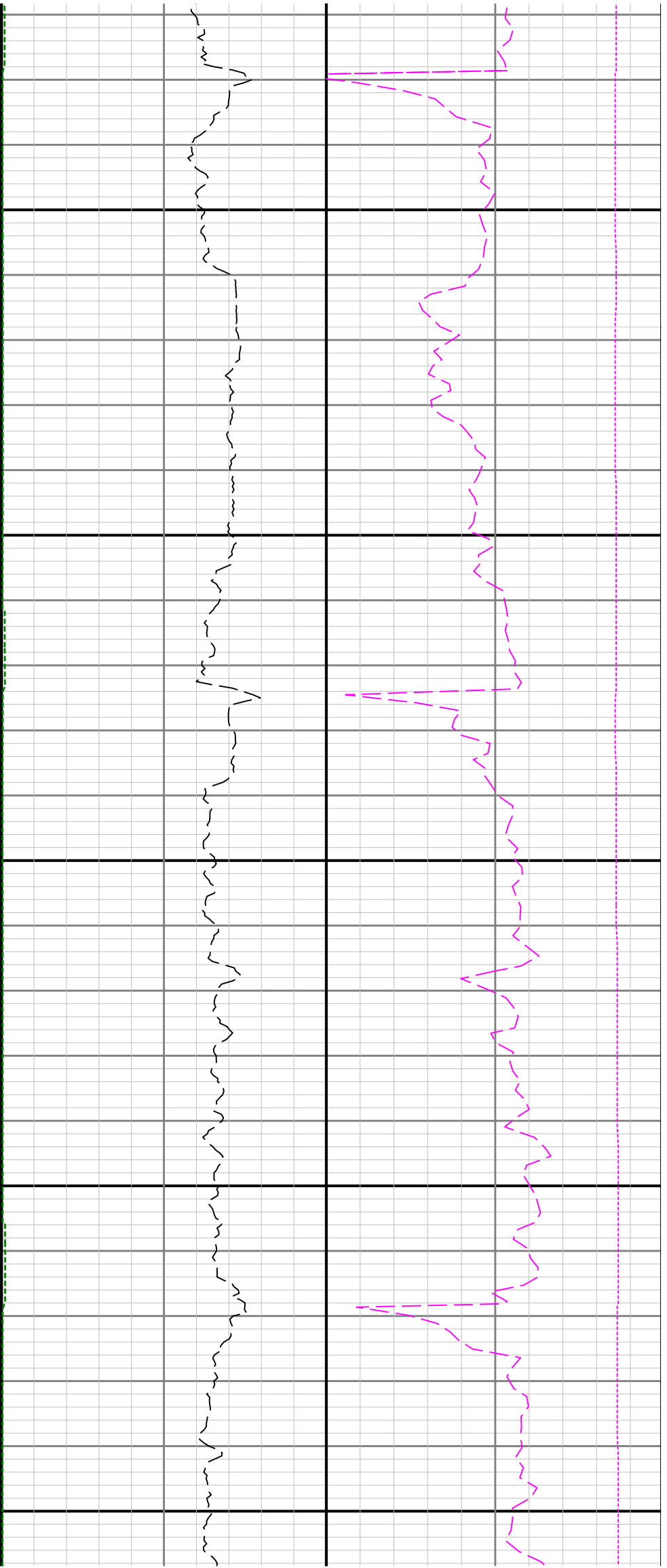


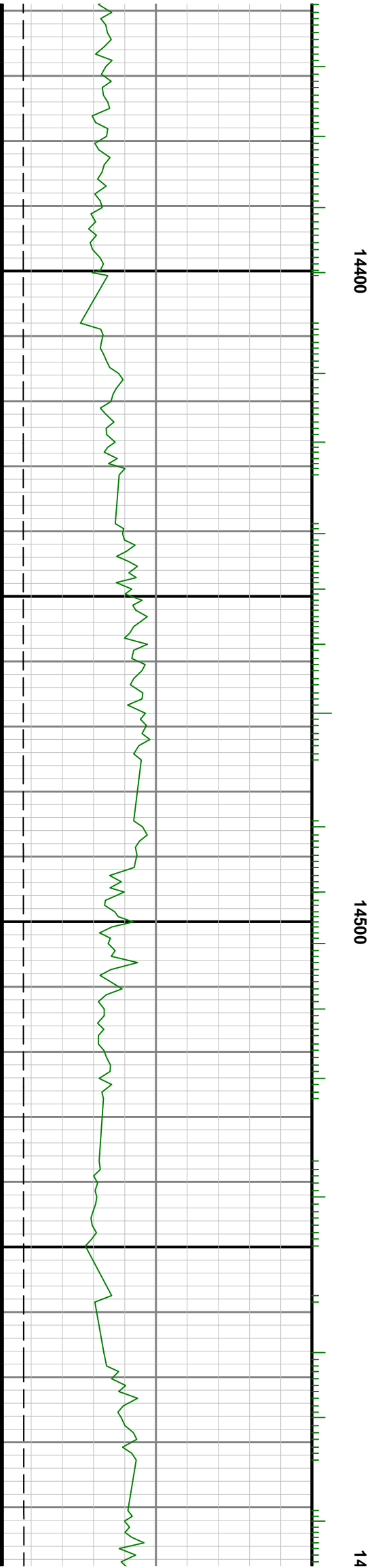
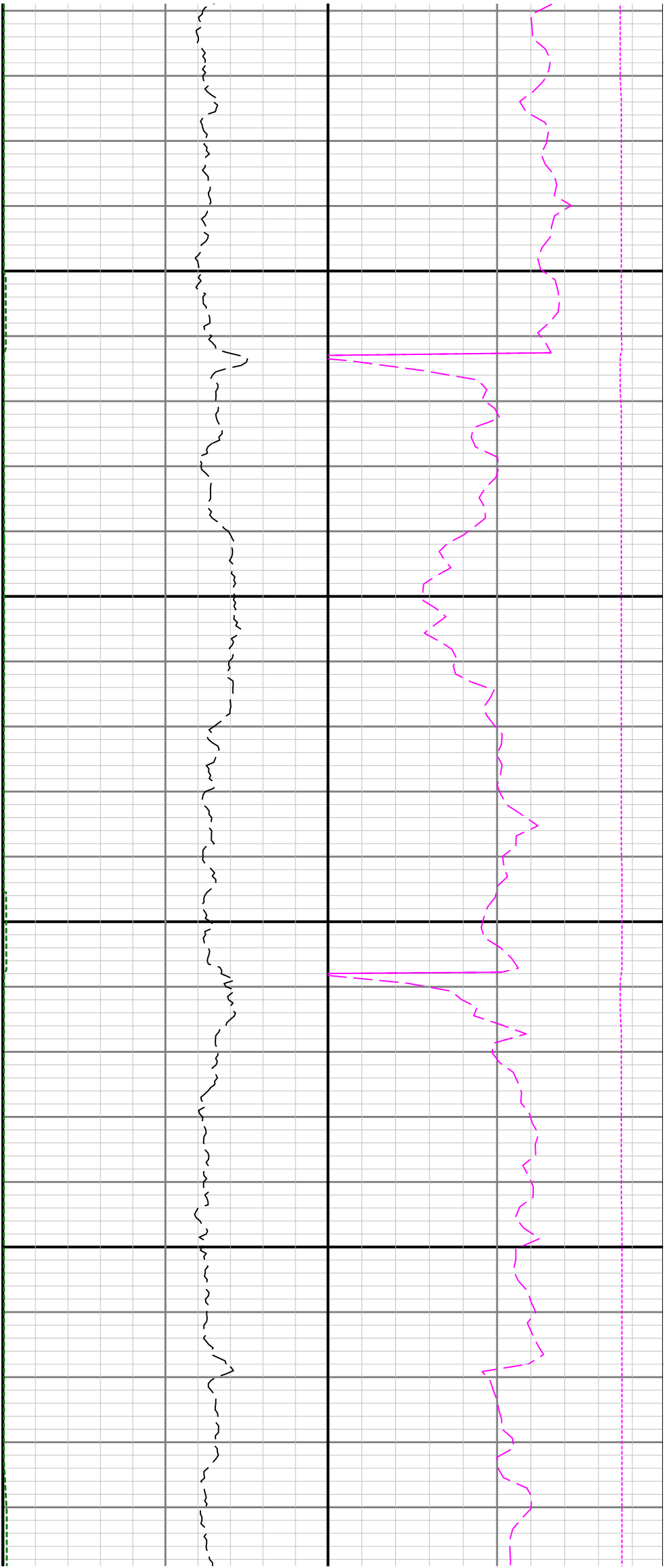
13700

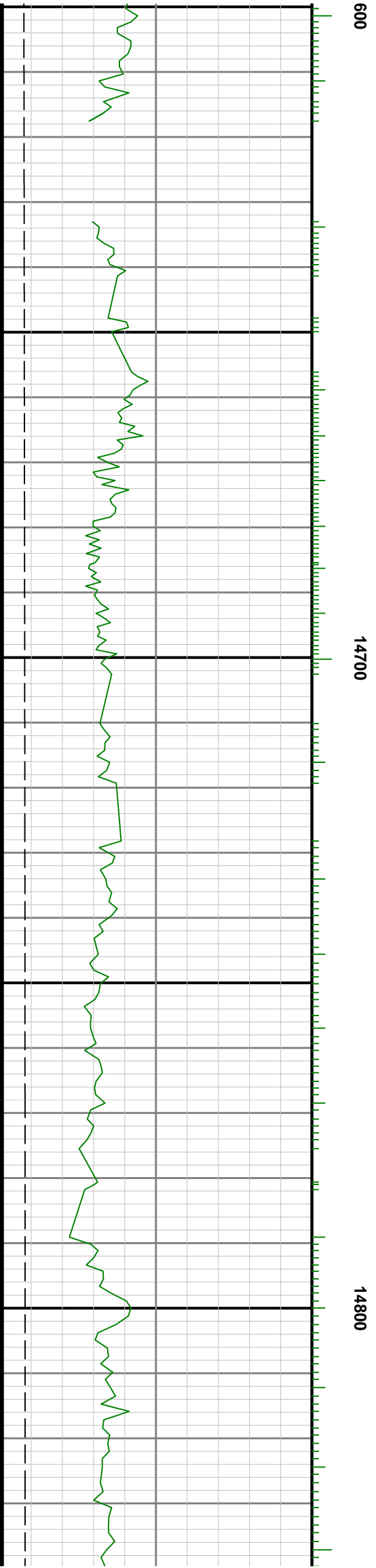
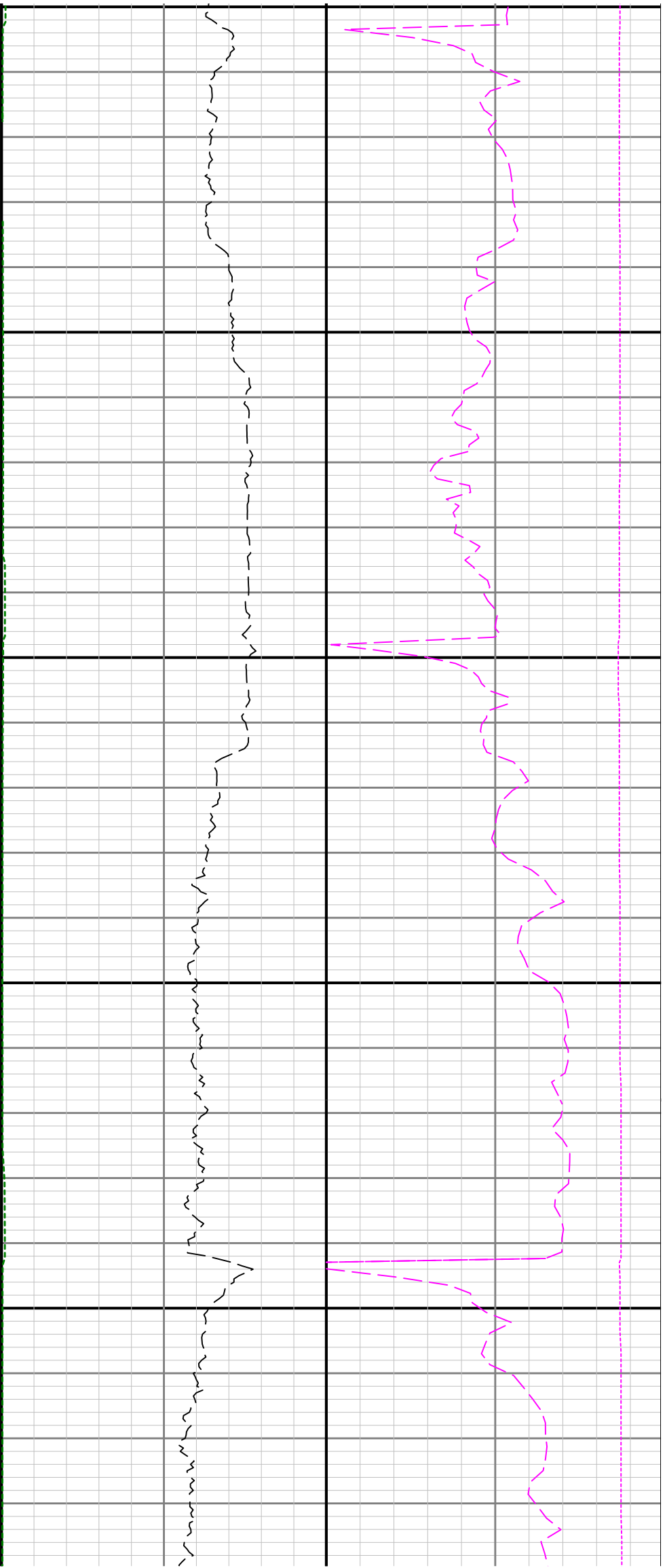
13800

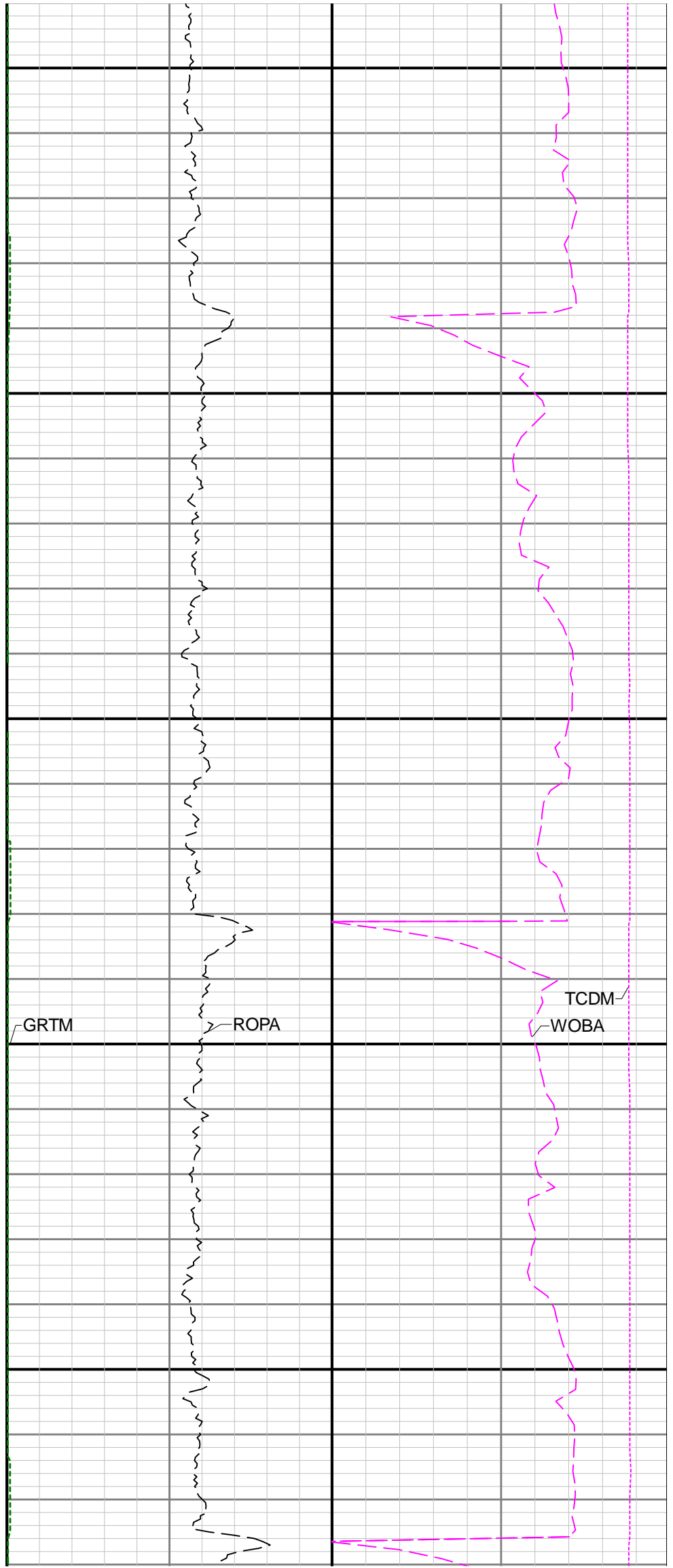
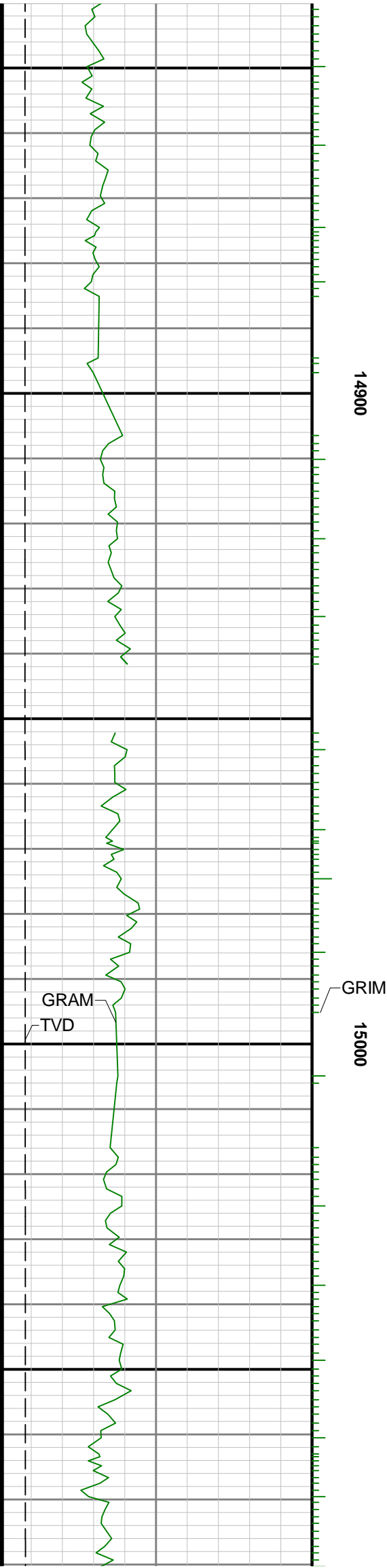


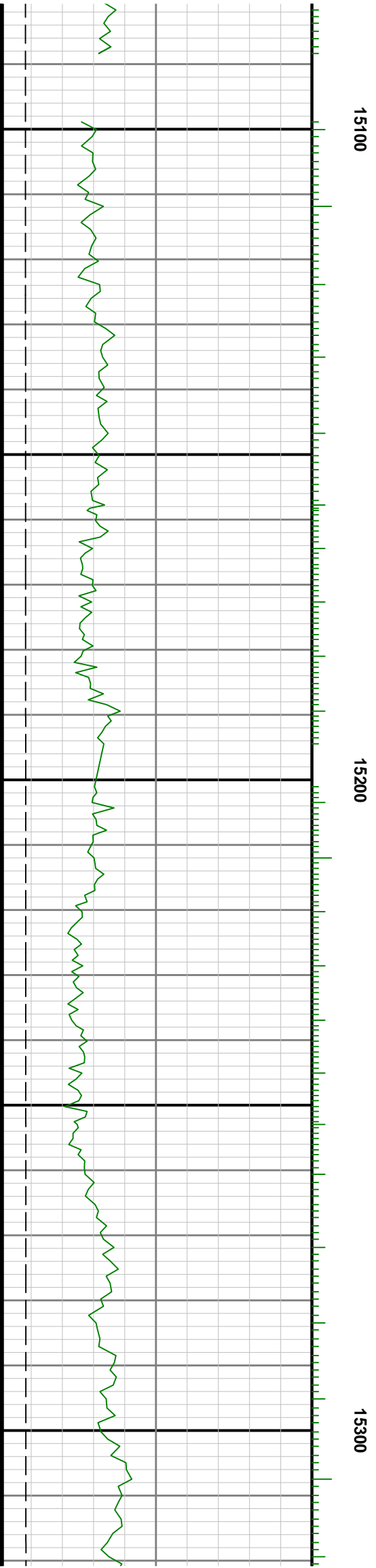
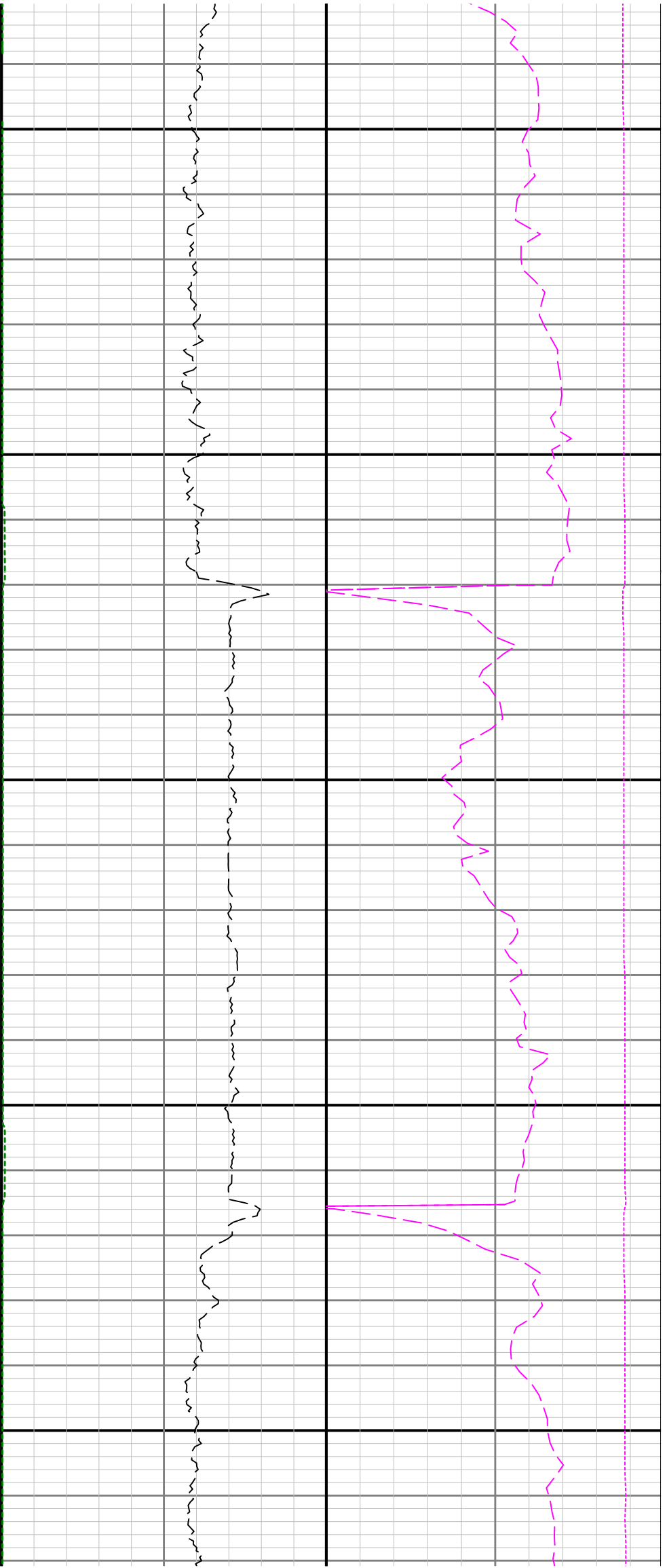


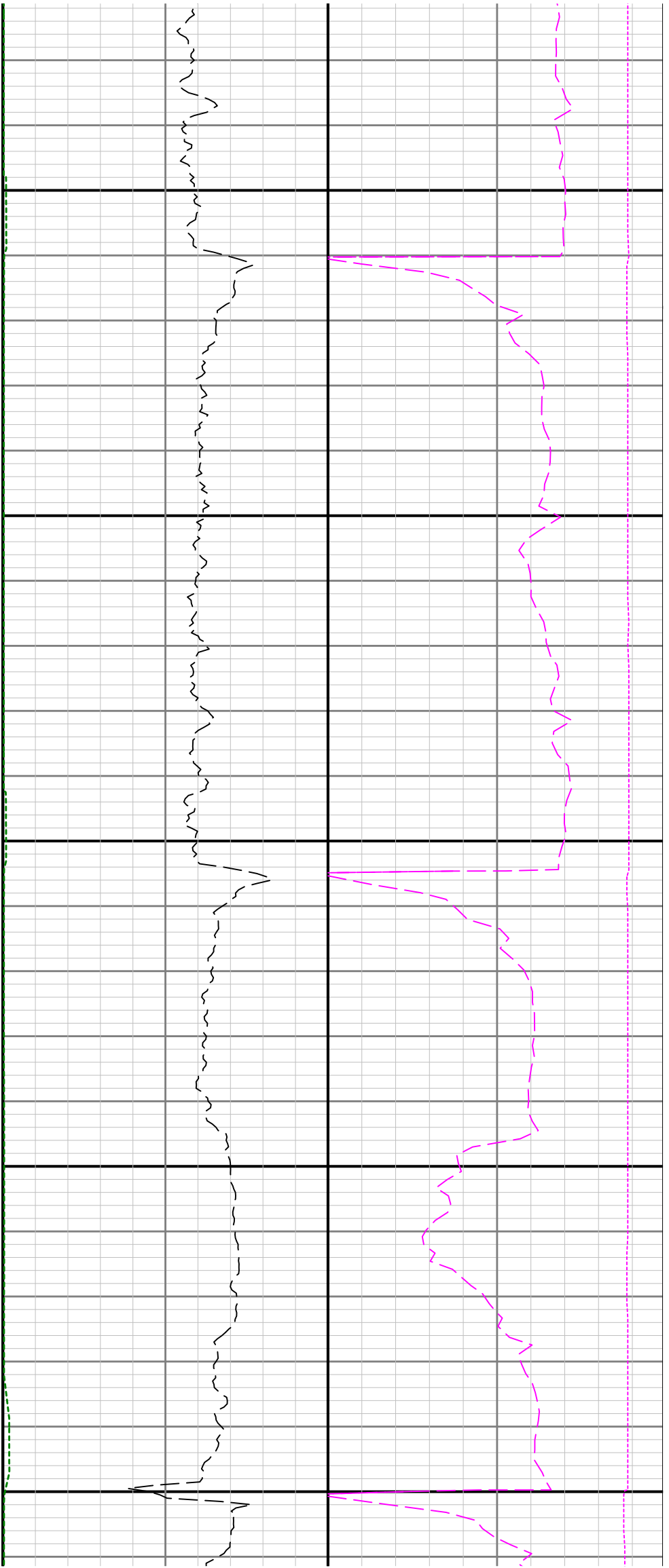






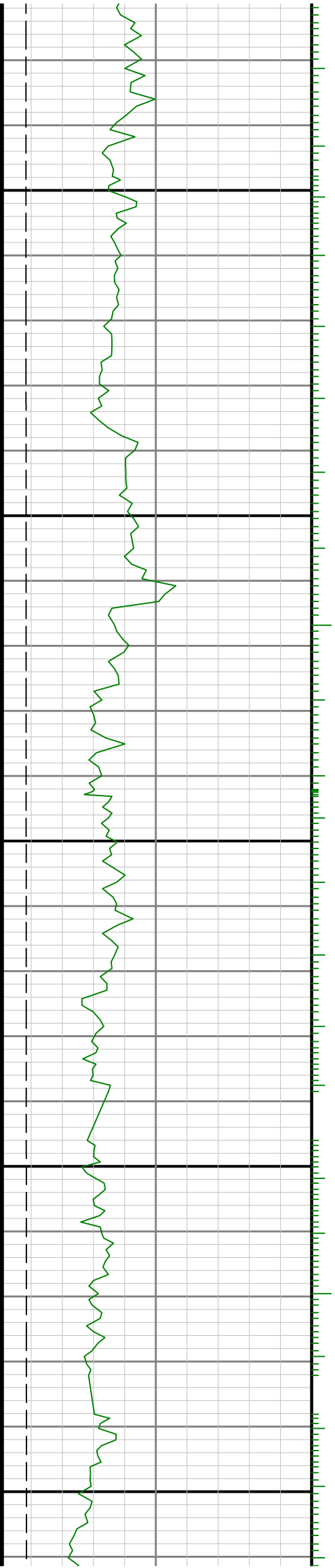


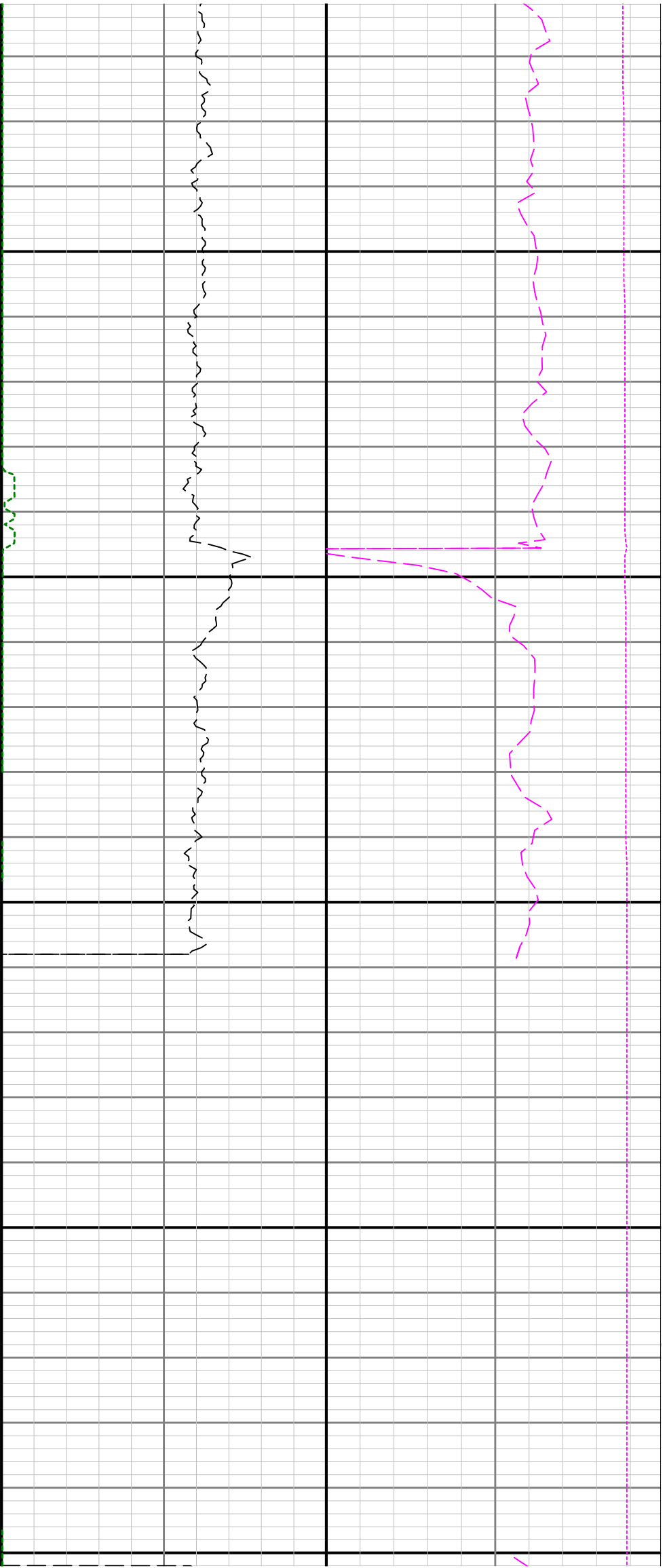




15400

15500



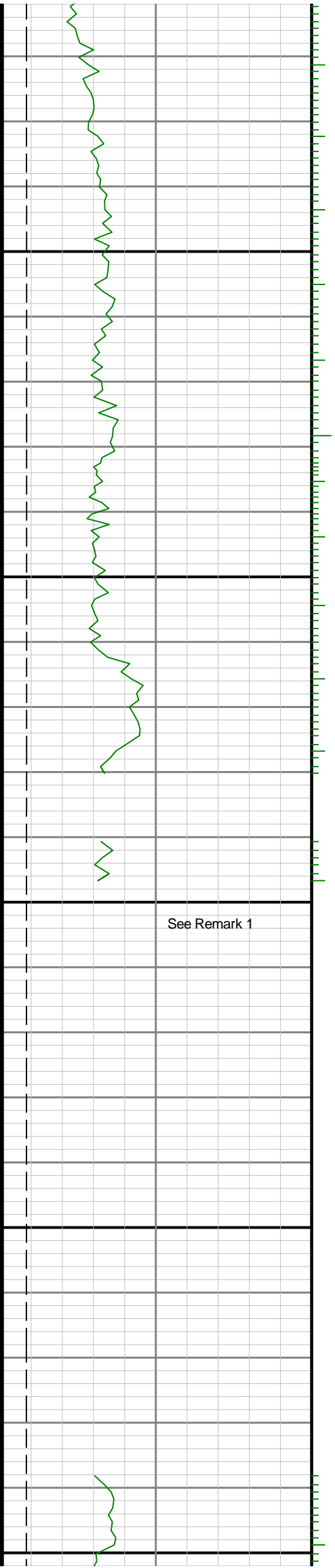


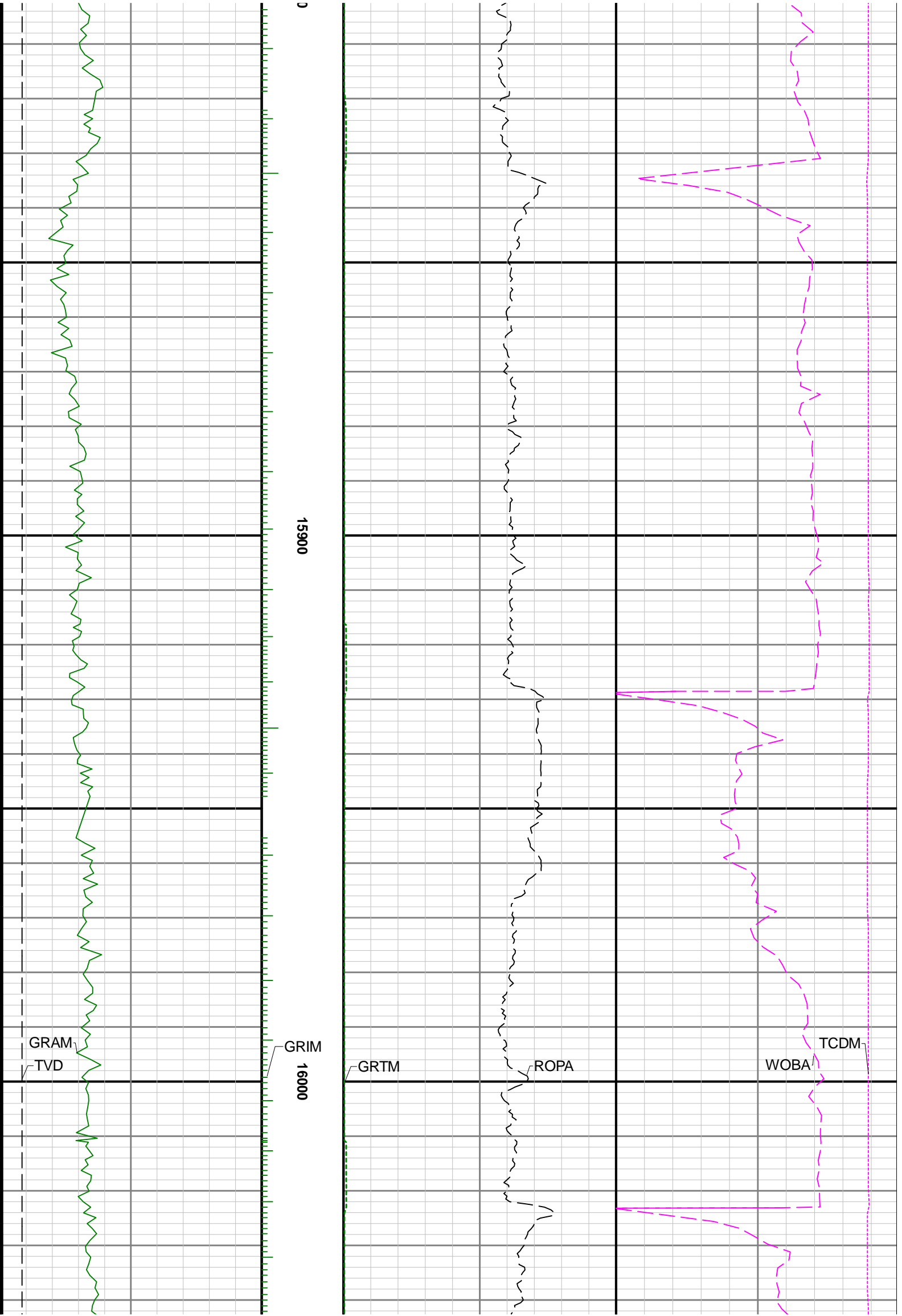
15600

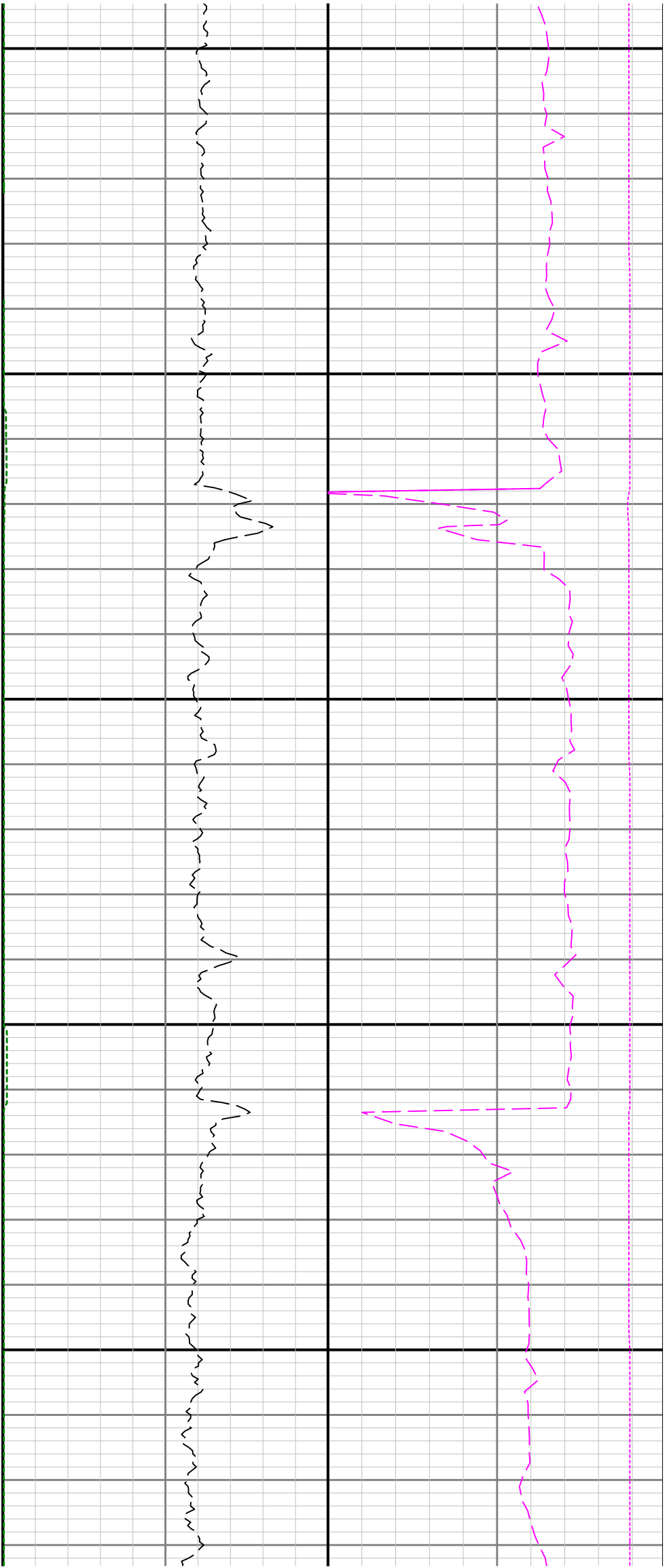
15700

1580

See Remark 1

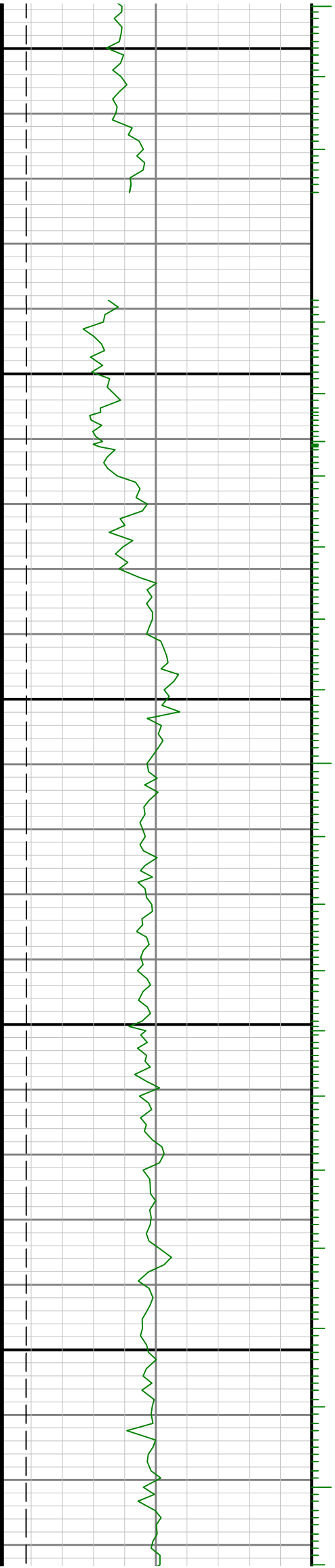


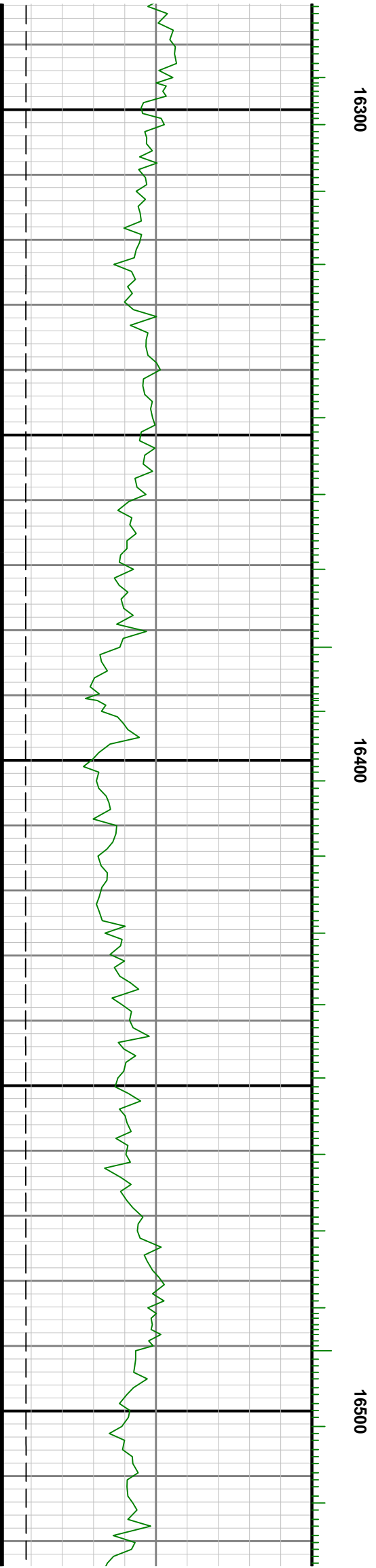


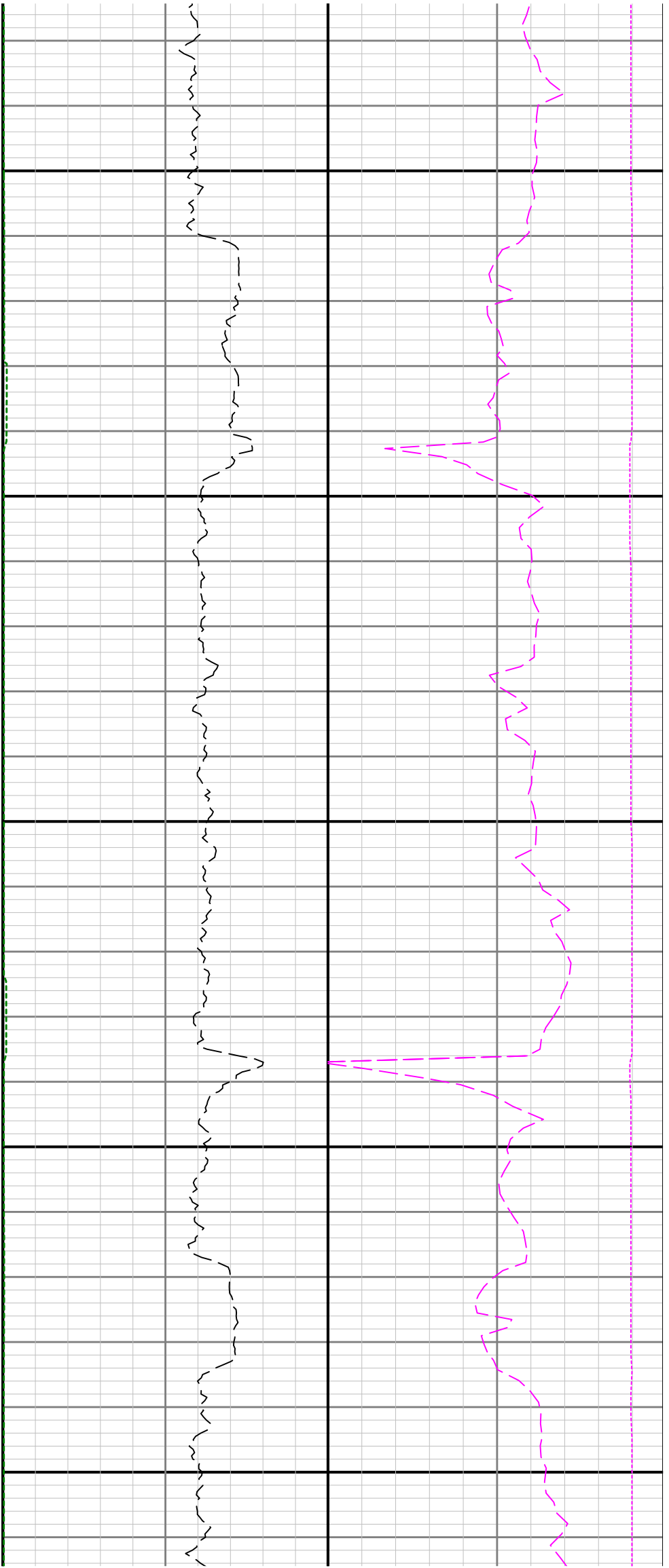


16100

16200

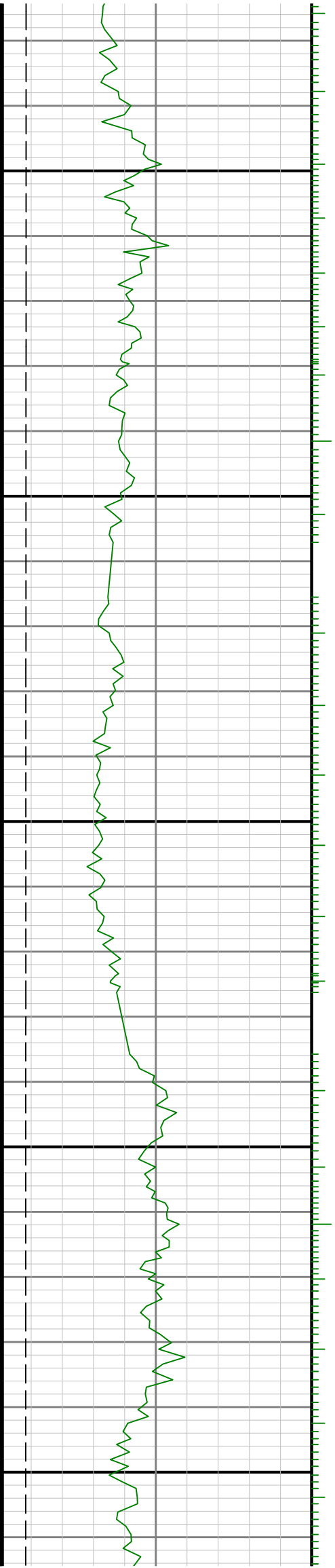


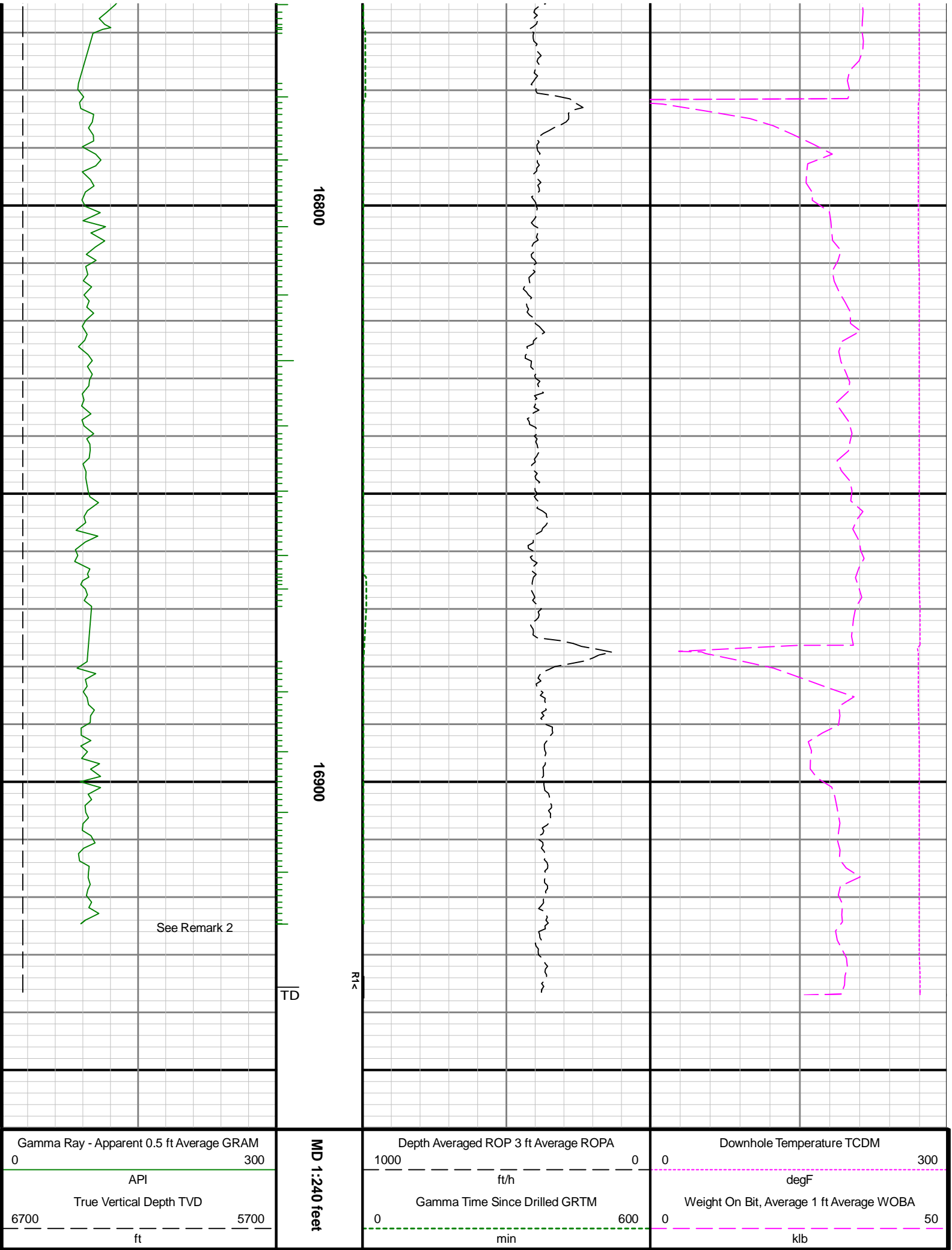




16600

16700





See Remark 2

TD

Rt <

Gamma Ray - Apparent 0.5 ft Average GRAM	
0	300
API	
True Vertical Depth TVD	
6700	5700
ft	

MD 1:240 feet

Depth Averaged ROP 3 ft Average ROPA	
1000	0
ft/h	
Gamma Time Since Drilled GRTM	
0	600
min	

Downhole Temperature TCDM	
0	300
degF	
Weight On Bit, Average 1 ft Average WOBA	
0	50
klb	